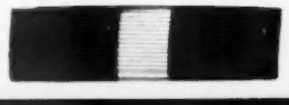
The OIL WEEKLY

"... EXTRAORDINARY HEROISM OR DISTINGUISHED SERVICE IN THE LINE OF HIS PROFESSION"

Navy Cross—U. S. Navy

Below. Ribbon which may be worn in lieu of the Medal



. . . As commanding officer, motor torpedo boat, in connection with military operations against (the enemy) . . . despite machine gun fire and 3-inch shore battery fire, searched (the) Bay for an enemy ship reported therein, located and sank a 5,000-ton enemy ship with torpedos without serious damage to his ship or casualties to his crew. . . .

For such extraordinary heroism is the Navy Cross awarded. It was established by Congress in 1919 for ". . . any person who, while in the Naval Service of the United States, has distinguished or who shall hereafter distinguish himself by extraordinary heroism or distinguished service in the line of his profession." It was intended to correspond with the Army's Distinguished Service Cross.

HUGHES TOOL COMPANY—Houston, Texas

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STRING SAVED AFTER 3½ HOURS ON BOTTOM

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LOOKING AHEAD
. . . with the Editor

MANY of the compressor and pumping stations now in operation have been on the line for as much as a score of years. Today these systems are confronted with the necessity of handling full and even overload capacities. The shortage of additional power equipment makes it almost mandatory that wherever possible prime movers now in operation be used in meeting requirements. Various ways of bettering camshaft performance, as a means of increasing the delivery capacity of existing units, is to be discussed in a practical manner in an article scheduled for early publication.

☆

The Oil Man's Calendar

APR. 28	Natural Gas Management Conference, Under Auspices of Natural Gas Section, American Gas Association, Gibson Hotel, Cincinnati, Ohio.
29–30	American Petroleum Institute, Division of Production, Southwestern District, Rice Hotel, Houston.
MAY 5– 6	Petroleum Electrical Association, Houston.
6– 8	American Institute of Mining and Metallurgical Engineers, Petroleum Division, Adolphus Hotel, Dallas, Texas.
7– 8	Independent Petroleum Association of America, Mid-Year Meeting, Jefferson Hotel, St. Louis, Missouri.
20–21	A.P.I. Mid-Continent Section, Production Division, Tulsa.
24–25	Joint Production and Chemical Committee Conference, Sponsored by Technical Section of American Gas Association, Hotel Pennsylvania, New York.

THE OIL WEEKLY

ENGINEERING « NEWS » STATISTICS

Published by THE GULF PUBLISHING COMPANY, Houston, Texas

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Published every Monday. Single Copies 15 cents (Except Special Issues). Subscription price: domestic and foreign, $2.00 a year; 2 years $3.00. Advertising rates on application.

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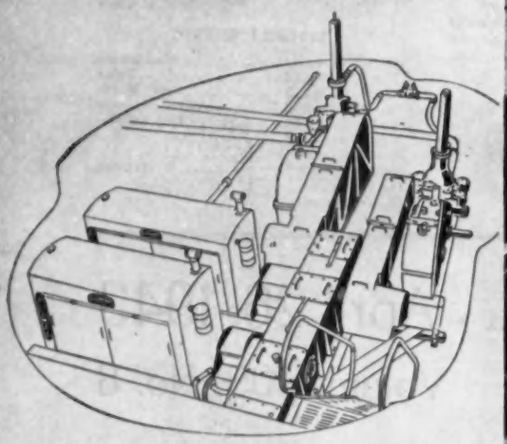

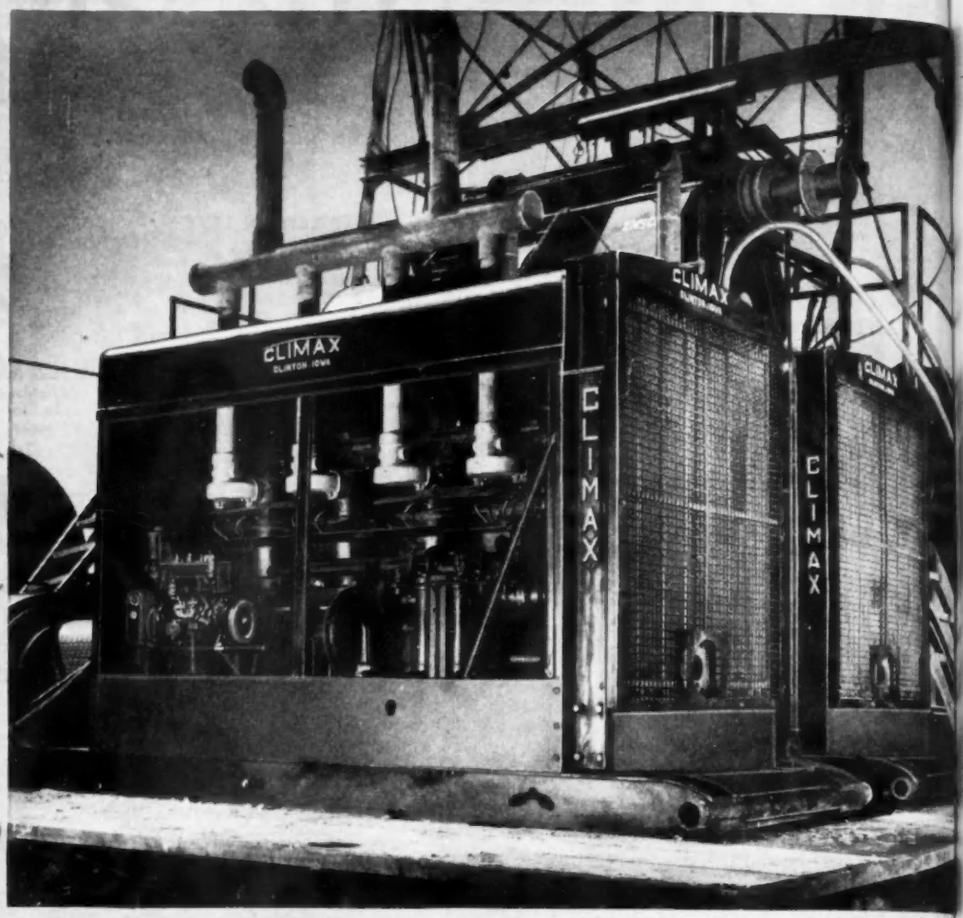

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The Changing Panorama

New Regulations Stop Raids on Oil Labor

RAIDING of oil industry labor by other war industries able to pay high wages to get skilled workers will be halted by the regulations issued by the War Manpower Commission to make effective President Roosevelt's "hold the line" order.

The regulations prohibit the transfer of workers from one essential activity to another which pays higher wages, except where an employment stabilization plan is in effect and then only if the present employer designates the worker as "available."

No objection is raised to transfers of labor from one non-essential activity to another, and transfers from non-essential to essential industries are encouraged.

Stiff penalties are provided for both employers and employees who violate the regulations, both being subject to a fine of not exceeding $1,000 or imprisonment for not more than one year, or both, and the employer also may be barred from counting the wages paid the worker as a deduction from income tax or as part of his cost of doing business, for the purpose of obtaining any price adjustments or determining costs in connection with any Federal contract.

Thirty-five groups of activities have been classified by the WMC as essential, including drilling, rig-building, maintenance service operations and petroleum refining.

Labor Shortage Makes Safe Practices Vital

FACED by manpower shortage in every field of operations these days, most companies are giving much more attention to safe practices in work than they have in the past. Every man-hour gained is that much more time saved to make up for labor shortages. Accidents from whatever source eat into production schedules and play directly into the hands of our enemies.

Gulf Oil Corporation is urging its employes to prepare talks or safety papers for presentation at regular safety meetings. Many splendid contributions from employes have helped to make their fellow workers safety conscious, thereby preventing accidents which otherwise might have occurred.

Employes are asked to give time to the preparation of material to be presented. Sources pointed out include facts and occurrences affecting the company from a safety standpoint; good magazine articles; accident statistics and safety education information from pamphlets issued by insurance companies; National Safety Council information and releases; clippings of newspaper articles regarding accidents; information and experiences drawn from one's own education and observation; selected topics from special fields such as health, first-aid, seasonal hazards, plant protection in war, and motor-vehicle driving.

In its instructions to employes, Gulf says: "If you have never made a contribution to one of your safety meeting programs, pick out a subject which you think needs attention and 'shoot.' Your fellow employes will no doubt appreciate the opportunity to hear you express your thoughts."

New Army of Trained Men Being Built

A TREMENDOUS educational process is going on in the United States today. As a result, this country will have a vast new army of trained machinists and manufacturers, which is likely to have very important post-war results, points out Duncan W. Fraser, president, American Locomotive Company. In paying tribute to the more than 500 sub-contractors, suppliers and others who helped his concern build the famed M-7 "tank killer," generally credited by military authorities as the most important weapon in the defeat of Rommel, Fraser said:

Thousands of little business men, small shops and manufacturers, and hundreds of thousands of workers are getting a technical education. They are learning how to handle new metals. They are learning new techniques. They are learning production methods, how to use new machines, how to read blueprints, and a hundred other manufacturing arts. They are not only learning manufacturing skills but also management skills.

Big business also is learning new things. Besides technical advances, big business is finding out that small business can contribute much to its own manufacturing needs and skills. This widespread cooperation will be important in post-war also, predicts Fraser.

Patent Donation to Aid Rubber Program

THE United States synthetic-rubber program should receive a big boost from Standard Oil Company's (New Jersey) offer to give the government of this country patent rights on Buna-S rubber, which is the basis of the nation's present program. The proposal, which lacks only approval of the company's stockholders, should give every possible incentive to full cooperation in the war rubber program, should remove concern about the post-war patent situation from the minds of everyone, and should encourage American research and ingenuity among all companies to tackle the rubber problem.

Under the plan the government would have a free license for itself not only during the war, but for the entire life of the patents, and in addition would give the government the right to issue royalty-free licenses to everyone who cooperates in war rubber program, including Standard's competitors.

Oil-Coal Fuel Being Given Thorough Test

EXhaustive tests of the oil-coal combination which has been under study by the Bureau of Mines have been undertaken by The Atlantic Refining Company in a boiler at its Philadelphia refinery.

A test consumption of 30,000 gallons of colloidal fuel has been arranged, during the run of which studies will be made of methods of storage and the effects of variations in the mixture and in combustion conditions.

If successful, the new fuel, containing approximately 60 percent oil and 40 percent pulverized bituminous coal, is seen by bureau officials as offering important possibilities in easing the heavy fuel oil situation in the East.

Tepetate After Six Years

Field already has produced more oil than estimated ultimate recovery prior to gas injection. Unique operations include first combination high pressure stabilization-gasoline-pressure-maintenance plant

By E. O. BENNETT and F. B. HAVERFIELD,
Continental Oil Company

An address before annual meeting of Natural Gasoline Association of America, Dallas, Texas, April 16, 1943

SINCE Continental Oil Company's Tepetate, Louisiana, high-pressure field-stabilization, gasoline and pressure-maintenance plant operation was the first of its kind in the petroleum and natural gasoline industry, a review of its performance during the past six years is of interest to those contemplating such operations and to the industry generally.

Tepetate field is unique among oil fields, as all phases of operation are concentrated at a central location in the pool. Oil and gas production from high-pressure wells is carried through single lines to high-pressure separators for each lease, which are located in a battery in the central plant. Gas from the separators is metered and passed through high-pressure absorbers for the removal of the condensible liquid hydrocarbons. Gas from the absorbers is compressed and returned to the producing formation. Natural gasoline recovered from the gas, along with propane, isobutane, and normal butane, is delivered by pipe line to the company's refinery at Lake Charles, where it is used in the manufacture of aviation alkylate, a product used in making 100-octane aviation gasoline.

Oil from the primary separators is metered and commingled in a common stream after which it passes through a crude-oil stabilizer. In the stabilizer the crude is denuded of the light fractions that normally would be lost in storage. The light fractions from the stabilizer are recovered as liquids in the natural-gasoline-recovery section of the plant. Oil from the plant stabilizer is run to the pipe-line station in the central plant and is pumped to the company's Lake Charles refinery where part of it is processed. The remainder is shipped either by rail or by tanker from the loading terminal adjacent to the Lake Charles terminal and refinery.

Centralization of the field operations has eliminated a low-pressure field gathering system and lease tanks and has greatly reduced the labor required for conducting all field operations.

Effect of Pressure Maintenance

Tepetate has been producing for over seven years, and pressure-maintenance operations have been conducted for over six years of this time. The oil recovery to date is greater than the estimated ultimate recovery would have been had the field been produced in the conventional manner. The estimated recovery from this pool by ordinary means of production was 11,000,000 barrels. Production to date is nearly 12,000,000 barrels. All oil subsequently recovered to the economic depletion of the pool will be obtained on account of the continuous return of gas to the producing formation. The ultimate recovery, under

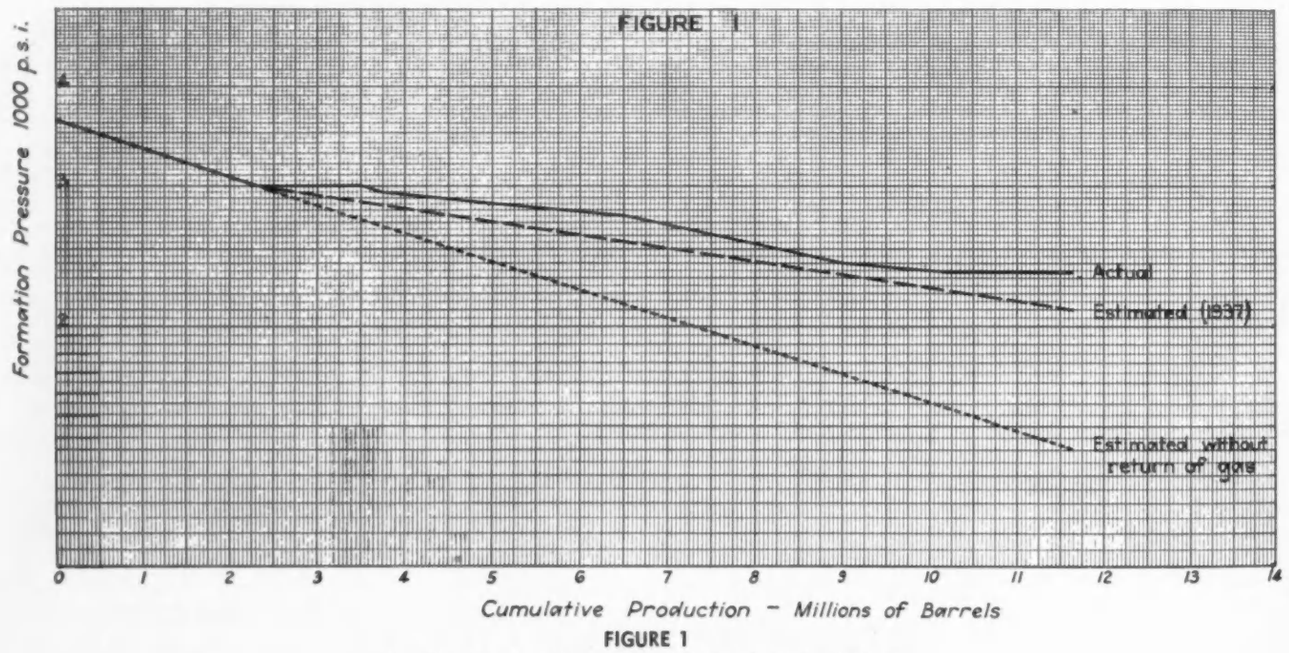

FIGURE 1
Cumulative production-pressure decline, Tepetate, Louisiana

the plan instituted, is expected to be as much as 150 to 175 percent of the ultimate that would have been produced by normal recovery methods. The pool is currently producing at the rate of 2750 barrels per day. This rate is determined by and limited to the number of barrels it can produce consistent with good production practice rather than an amount required for market demand. Producing rates should always be governed in this manner except where production demands of strategic crude on account of war emergency may exist.

of slope of the pressure decline line. If the above volume of gas had not been returned, it is estimated that the present formation pressure of 2345 p.s.i. would have been reduced to 1400 p.s.i., as shown by the extension of the pressure-decline curve slope established before any gas was returned; thus a saving of 945 p.s.i. of formation pressure has been made. The energy stored in the reservoir by this gas-conservation program is sufficient to flow all the recoverable oil the pool will ever produce. The saving of pumping equipment otherwise required and the reduced lifting cost for the oil produced up to the present time have been more than sufficient to pay for the entire installation of all necessary equipment for compressing and returning gas to the producing formation.

as known deposits of coal in a mine. Gas for fuel, however, may be produced with less effort and expense than a heat value equivalent from a coal mine and in a much shorter time.

Effect of Gas Return on Gasoline Content of Produced Gas

Figure 2 shows a cross-sectional view of the Tepetate field under original reservoir conditions. It will be noted that the gas-oil contact plane is 8254 and the water-oil contact is 8282 feet. Both

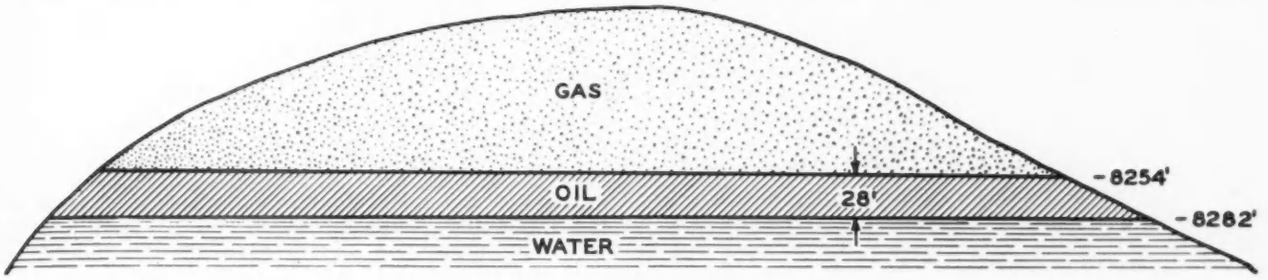

FIGURE 2

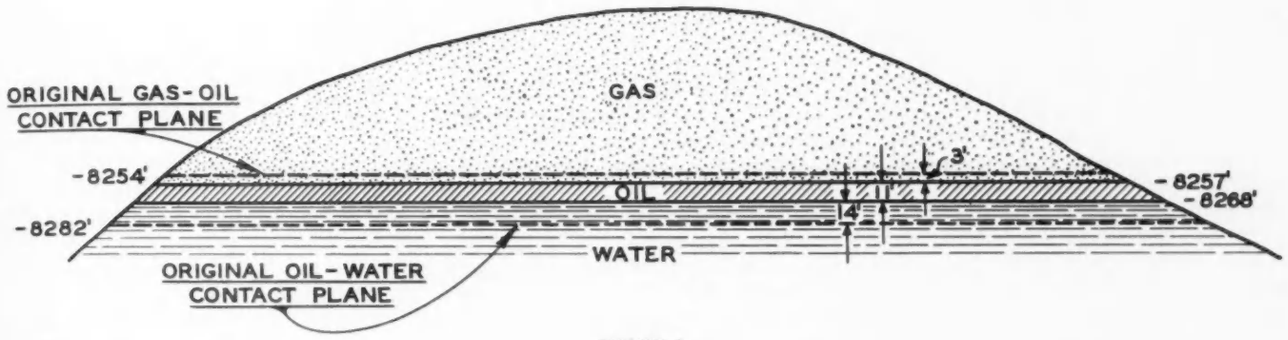

FIGURE 3

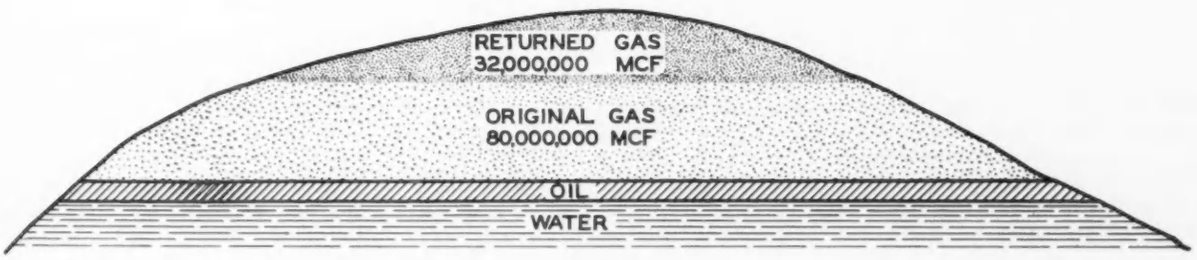

FIGURE 4

During the past six years over 32 billion cubic feet of gas have been compressed and returned to the producing formation. Under existing subsurface temperature and pressure conditions, this gas occupies reservoir pore space equivalent to that of 43,500,000 barrels of liquid, and its return to the producing formation has been responsible in greatly retarding the rate of pressure decline and water encroachment.

The line on Figure 1 shows the relationship between cumulative production and pressure decline. The effect of the gas returned is reflected in the change

The 32 billion cubic feet of gas returned to the producing formation at Tepetate contains 41,600,000,000,000 B.t.u. of heat energy, which is equivalent to the heat energy in 1,500,000 tons of average dry bituminous coal.

From a fuel angle, gas saved in a closed reservoir is considered the same

measurements are sub-sea levels and were obtained from a careful analysis of electric logs taken in each well as it was drilled. These data show the original sand section saturated with oil to be approximately 28 feet thick.

Figure 3 shows the relative positions of the gas-oil and water-oil contact planes after seven years of continuous operation. The original gas-oil contact plane has been lowered 3 feet and the water-oil plane raised 14 feet, leaving approximately 11 feet of saturated section. It was planned to have the gas-contact and water-contact planes ap-

proach the center of the section at the same rate, but the sale of some gas prevented the gas cap expansion originally anticipated.

Wells originally were completed in the approximate center of the 28-foot saturated section with only 30 inches of perforations in the casing. As the rising water table approached the bottom of these perforations and the wells began to produce water, they were plugged back and reperforated slightly higher. The plugging back and reperforating in only a few feet of sand 8300 feet below the surface is a very difficult job; however, good results have been accomplished. To date the water encroachment has necessitated the reworking of 33 wells and the abandonment of 4 edge wells.

With the lowering gas-oil contact plane, as shown by Figure 3, it can be seen that, as the field becomes older, gas-oil ratios will continue to increase because of gas coning at producing wells on account of differential pressure and an ever thinning liquid seal over the casing perforations. Production rates must be controlled at all times to maintain a liquid seal over the casing perforations. The shorter the length of casing perforations the more readily such control may be effected. The past six years' performance of this pool has proved the advisability of completing wells as described above.

It would first appear that an increase in gas-oil ratio would decrease the percentage of recoverable liquid hydrocarbons from the produced gas. This, however, has not happened, and a comparison of analyses for liquid hydrocarbon recovery made at the start of operations and at this time shows that there has been practically no change. The first analysis was made in 1936, the last one this year.

Figure 4 shows a cross-sectional view of Tepetate field. It also shows the amount of gas returned in the densely shaded section and the present location of such gas. The gas in the structure above the oil level was in equilibrium with the oil in the saturated section prior to any development; and since the dry residue gas was returned to the crest of the structure, there has been no by-passing of dry gas into wells producing oil. The gas produced with the oil is either solution gas or free gas in equilibrium with the oil from the gas cap adjacent to the wells. Its quality remains practically constant and will continue to do so until enough has has been produced with the oil and sufficient dry gas returned to displace the entire original volume of gas in the gas cap. Experience indicates that dry gas returned to the top of the structure does not readily mix with the wet gas in the cap but displaces the wet gas ahead of it as additional volumes are injected. Due to the existence of the above action, it can be seen that the performance of the gasoline plant will remain practically constant over a period of many more years. It is further indicated that when the gas cap becomes completely filled with dry residue gas, such residue may be forced into and through the oil zone before being produced and that it will become partially saturated with condensible hydrocarbons and further extend the operating plant life and add to the total liquid-hydrocarbon recovery. A gasoline plant operating in connection with this type of field practice is more assured of a financial pay-out without many of the hazards normally encountered. When this process has reached its economic limit, the volume of gas saved up to that time will be available for market use, for reforming to synthetics, or for use as fuel.

Gas returned since the start of gasoline-recovery operations has maintained the pressure high enough to assure continued uniform operation of the high-pressure absorber plant and present indications are that this plant may be kept operating by well pressure to the economic limitations of oil and liquid-hydrocarbon recovery. This fact is emphasized as there has been considerable discussion concerning the advisability of high-pressure operations on account of possible plant obsolescence due to well-pressure depletion before proper recovery was made. It can now be definitely stated that, in connection with pressure-maintenance systems properly operated, high-pressure absorption processes are cheapest and most economical and may be operated with no more difficulty than any of the generally known low-pressure processes. Since the Tepetate plant was placed in operation, many absorption plants operating at much higher pressures have proved the efficiency and wisdom of development in this direction. Plants with operating pressure approaching 2000 p.s.i. are now giving excellent recoveries in absorbing light hydrocarbons that were formerly inefficiently recovered by retrograde condensation. It now appears that, by recirculating the heavy molecular cut out of a liquid recovered from gas by retrograde condensation as an absorbent media, operation pressures far in excess of 2000 p.s.i. may be used; and certain recovery operations heretofore considered impractical will become commercially attractive.

One of the numerous benefits of a gasoline-plant operation in connection with a properly controlled field stabilization and pressure-maintenance system is the uniform rate of production which may be maintained. In the Tepetate field the plant throughput has been very constant day after day, and load peaks have been eliminated. Any plant operator will appreciate the value of such a condition existing over a period of years, both from an operating and a producing angle. While this plant and pool are owned by one operator, the same type of operation is being obtained by co-operative arrangements in areas of divided ownership.

Liquid Meters

In order to operate a field-stabilization plant in connection with natural-gasoline-recovery operations, it is necessary that all liquids produced from the wells be measured under pressure until such well liquids have been stabilized to pipe-line conditions.

The only practical manner that this operation has developed by which liquids can be accurately measured under pressure is with meters. Such meters are either of the rotating or reciprocating-piston type.

Many millions of barrels of oil have been measured by meters in the Tepetate field, and no particular difficulties have been encountered. Normal wear and tear on meters due to amorphous sediment in crude oil must be expected, and periodic inspection and adjustments must be made to keep meters in proper working order. Experience has shown that filters having suitable permeabilities for the stopping of sediments that cause wear will become plugged after very short operating periods and that their use cannot be justified.

High-Pressure Meters

Meters for use in measuring high-pressure liquids are expensive because of the design and materials required to withstand the differential between the line pressure and atmosphere. Figure 5 shows an arrangement in general use at Tepetate whereby a 25- or 50-pound working pressure meter may be used for operation on any pressure up to several thousand pounds per square inch. The method consists of installing the meter in a secondary case with its intake connection open to the inside of the case. The discharge connection of the meter is carried out of the secondary case through a suitable stuffing box as shown. Pressures of any magnitude may be packed off in such a stuffing box. As shown in the sketch for the meter setting, the outer casing may be made with a settling trap at the bottom for the accumulation of sand and other large particles. This settling trap has been found advantageous in eliminating wear and tear on the meters. The counter drive shaft is taken through the outer shell through a small bearing and stuffing box and has operated in a satisfactory manner. Magnetic drives through a nonmagnetic diaphragm are now being developed and will eliminate

the necessity of the stuffing box and bearing. Where many positive displacement meters are used in a battery, it has been found advisable to install an overhead craneway to aid in removing any particular meter for inspection, calibration, and repair. At Tepetate the craneway extends over the meters and into the meter repair shop at the end of the installation row.

Outside Installation of Equipment

Six years of operating experience has definitely indicated that outside installation of motor-driven pumps and boilers is feasible and practical and minimizes initial plant installation and depreciation costs by the elimination of buildings. This type of installation, however, is not recommended for regions where temperatures far below freezing exist during winter months.

Header and Piping Arrangement

Elevated engine room floors with all high-pressure lines brought outside under such floor levels but above outside grade lines with all headers exposed have proved advantageous from a maintenance and inspection standpoint. This general arrangement has been almost universally adopted by the industry in the design of plants in connection with high-pressure gasoline and condensate-recovery plant operations.

Welding of Heavy High-Pressure Lines

The only failures of welded connections that have been observed have been a few hairline cracks immediately adjacent to welds in lines tying into compressor cylinders. It is believed that these have been due to the use of too heavy beads in the initial welding and that a multiplicity of lighter beads on thick-walled pipe will eliminate such occurrences. In no case has any leak of consequence developed, and those appearing have been satisfactorily repaired by welding.

Alloy-grade drill pipe was used for certain high-pressure field lines when suitable medium-carbon steel was not available. Difficulty was experienced in welding such lines, as such pipe originally was designed for screwed connections; and no suitable welding rod material was available. Since there is a shortage of critical materials due to the war, operators may be forced to the use of alloy-grade pipe on hand; and they should take extreme precautions when fabricating such pipe by welding.

High-Pressure Check Valves

The initially designed non-return valves for high-pressure gas lines at Tepetate were equipped with ball-and-cage checks, as no suitable check valves were available at the time of plant installation. Pulsations caused by compressor surges of dense gas caused the balls to oscillate and pound against their cages and seats, causing undue wear. Wafer-type valves similar to those used in compressors have been substituted and this trouble eliminated. The use of wafer-type, non-return valves is recommended for all high-pressure gas lines receiving their supply from compressor cylinders.

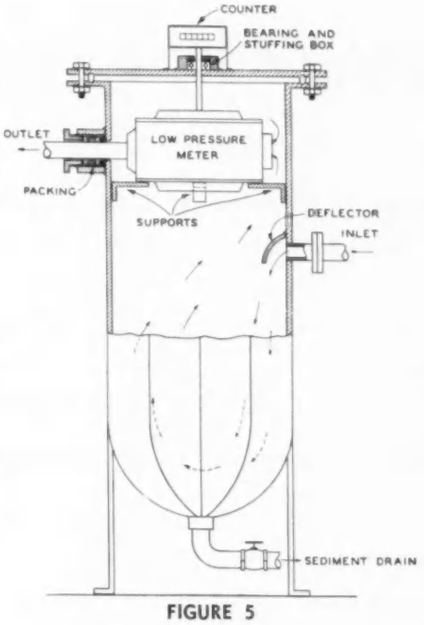

FIGURE 5

Desalting of Crude

One of the first large desalting plants was installed at Tepetate for the removal of salt from the hydrocarbon liquids produced. Well-head liquids carry salt content as high as 2465 grams per barrel. This liquid is treated with an average of 0.00183 gallon of chemical per barrel and then run through electrostatic precipitators where the salt content is reduced to approximately 1.3 grams per barrel. Several years' operation of this type of desalting equipment has definitely proved its worth in plant operation and has eliminated many thousands of dollars of wear and tear on refinery heat-exchange equipment. During the operation of desalting, dehydration is also accomplished, and no further treatment of the well production for water removal is required.

Blow-Out Safety Discs

Frangible-type rupture discs in lieu of safety valves have proved efficient and satisfactory. Experience has indicated that the discharge lines below safety discs should never be manifolded together to a vent, as the pressure surge on the down stream side of the discs will cause them all to rupture when any one disc fails.

Header Hold-Down Clamps

The header hold-down clamps used in this plant consist of a U-shaped stirrup over the header. The ends of the stirrup are welded onto a plate set in the concrete supporting block. Three set screws pass through the stirrup in radial alignment toward the center of the header pipe. These set screws are backed away from the header until operating temperatures are reached and are then tightened down just enough to stop vibration. A sole plate is used at the end of the set screw to prevent it from abrading the pipe. This arrangement permits motion due to temperature change and has been entirely satisfactory. Its use has been generally adopted in most high-pressure operations.

Plant Ventilation

Forced-draft ventilation in engine and compressor rooms has proved advantageous, and its use is recommended for all high-pressure plant operations.

Motor-driven uptake fans located at the ridge of the plant building have been found to give best results. With such units, engine and compressor rooms have been kept to workable temperatures and explosion hazards minimized. Complete explosion-proof electrical equipment should always be used.

In concluding we note the closing paragraph of an article on stabilization by F. L. Kallam.[1]

"It is the writer's concluding opinion that crude-oil stabilization can be adapted to many of our domestic fields in sizes commensurate with the local conditions. Fundamentally, no issue can be taken with a process which cures evaporation loss at the source and makes unnecessary the subsequent recovery of such losses in order to prevent economic waste. In all new fields, and in many of the existing fields, the system of crude-oil stabilization should be carefully considered in view of its possibilities for greater efficiency and economy in conserving our petroleum resources."

It should be emphasized that the successful operation of an integrated plant such as the one at Tepetate which involves three operating divisions of the company: namely, the production, natural-gasoline and gas, and pipe-line divisions, requires the full cooperation of each and close coordination between all. This has been accomplished with gratifying results under the direct supervision of the natural-gasoline and gas division.

In acknowledgment for many of the innovations which made the construction and operation of such an integrated plant feasible credit must be given to the field men of all divisions.

[1] "Stabilization of Crude Oil," by F. L. Kallam, March, 1943, Petroleum Refiner, Volume 22, No. 3.

Discovery Thinking

With doubt increasing as to ability of industry to maintain supply of petroleum through the years ahead, research on many of the fundamental problems of discovering new supplies can not start too soon. An industry spending a quarter of a billion dollars annually on exploration can afford to set aside a small percentage of this money in an attempt to make their effort more effective

By A. I. LEVORSEN, Geologist, Tulsa, Oklahoma

Part 3 of an address before the annual meeting of American Association of Petroleum Geologists, April 7, 1943, Fort Worth, Texas

THE time is fast approaching when some extensive fundamental research is called for in petroleum geology. Most of the research laboratories of the oil companies are devoted chiefly to studies of refined products; new uses for petroleum; development of geophysical instruments; and development of engineering and production principles and techniques. In these modern research laboratories, as well as in the exploration departments, we find the efforts are directed chiefly toward the improved utilization of petroleum which is already discovered or produced rather than toward the more fundamental problem of discovering new supplies to replace those that are now being consumed.

If there is any doubt as to the ability of the industry to maintain a supply of petroleum through the years ahead—and we all realize there is such a doubt—then through some means or other, research on many of the fundamental questions concerning the occurrence of petroleum cannot start too soon. Most of our oil provinces have been discovered contrary to the orthodox geological opinion prevailing at the time, which is pretty good evidence that our fundamental thinking is not sound. Other industries, which use petroleum products, are developing new uses through research, but our thinking has been standing still on the problem of discovering the supplies these increased demands call for.

An industry that spends a quarter of a billion dollars or more each year on exploration can well afford to set aside a small percentage of this money in an attempt to make the effort more effective, if not to save the entire situation. This is in fact a public responsibility. It can be done as a broad industry-wide approach, such as is being done on a small scale by some members of the American Petroleum Institute in the study of the origin of petroleum, or it can be justified as a legitimate private-company expense if but for the simple reason that it is a practical and economical insurance against the day of insufficient supply.

Some of the avenues of research that can be engaged in profitably are suggested in the following discussion.

Source Rocks

"What is it and where does it come from?" has been a question in the minds of many since the first oil, pitch or asphalt was discovered in the beginnings of human history. At no time, however, has there been any demonstrable proof of the mode of its origin and, although there have always been many theories and explanations, yet even today we have nothing upon which we can depend as satisfactory. As a matter of fact, the most recent thought on the question of the origin of petroleum indicates that it may well be a much more complex and involved process involving chemistry, bacteriology, physics, and geology, than anything we have even thought of heretofore. The more we know of the subject, the more difficult appears to be the answer.

Yet, in spite of the evident lack of information, the oil industry has either spent or withheld millions of dollars and great quantities of time and materials, on what was the currently prevalent thought on the subject. As long as discovery was adequate, the question of origin was of purely academic interest, and it did not make much, if any, vital difference to anyone what the ideas were on the source material of petroleum—whether it was the urine of whales as some early investigators thought, or the products of subterranean volcanism as was thought by others, or the more modern ideas of organic material deposited in marine sediments.

The chief geologist of one of the major companies told me last summer that while attending college, and after considering the subject of source rocks, he wrote a thesis with the title, "Why It Is Impossible to Find Oil in West Texas," and it received much favorable comment from the faculty. That was the prevalent thought of the time and it acted as a stone wall beyond which the orthodox geologist was unable to see. The question of whether or not there were source rocks in West Texas was the chief fundamental question upon which exploration out there was either done or not done. In the early twenties it was a real stroke of luck for Gulf Oil Corporation to have on its staff men like Kip Harper and Ben Belt, who had escaped in some manner from the mental fence concerning the lack of source rocks in West Texas, within which the average geologist had retreated. Thus, while one company with a liberal viewpoint on this question acquired many millions of barrels of oil, the others, largely because of a different viewpoint on this one question were prevented from participation.

Now, as a matter of fact, no one at that time knew whether or not there were source rocks in West Texas for

Part 1 of this article, published in The OIL WEEKLY April 12, suggested that if the industry is to discover huge volumes necessary to keep supply in balance with future demand, it must commence thinking in terms of "big" geology, which means in terms of wholly new oil provinces instead of individual fields, and square miles in place of acres. As examples, it presented two types of geological concepts or principles to show the kind and the scale of thinking that seems to be called for in an attempt to formulate a better idea of the nature and the extent of the undiscovered reserves of petroleum in the United States. The first of these was up-dip wedge belts of porosity in reservoir rocks and the second was the layers of geology which are separated by unconformities.

Part 2, published in The OIL WEEKLY April 19, said that with still vast quantities of favorable formations, the declining rate of discovery indicated something was seriously wrong with prospecting technique. It declared there was need for creative geology in place of routine geology, with opportunity and encouragement provided for developing new ideas. In analyzing prospecting methods, such questions as the following were raised:

Is our economy framework properly tuned when bigger pay jobs are in administrative and production duties? Is our operating framework good when 90 percent of a geological department's time is spent in routine, development and administrative duties, instead of searching for new fields? Does it make sense for the industry to continue to look for structural traps when the big majority of past discoveries have been stratigraphic accumulations? Are new exploration tools generally designed to catch the eye of the executive rather than the elusive oil field?

the simple reason that even today no one knows what a source rock is. The chief reasoning upon which the prospecting or lack of prospecting was based was prejudice—pre-judging—and in so far as a source rock is concerned, it is still prejudice. Yet the argument comes up continually that an area is unfavorable because it does not contain a "source rock." "I like to see some black shales, or at least some dark shales," "There ought to be some fossils in all that limestone to indicate a source rock," "Where is your source rock," and so on is a common excuse for not drilling in new territory.

Is it not ordinary common sense to spend some money on trying to find out something definite about source rocks? Or at least to recognize applications to which lack of such knowledge applies? How many productive areas have been condemned because some geologist thought there were no source rocks? With the exception of the relatively small appropriations available to the API Research Committee, in the work of Trask and the present project on the origin of oil, there has been only intermittent and casual interest in the subject of the source material of our oil fields. Yet the industry is paying in a big way for its lack of such knowledge and will continue to pay in a big way until something is done about it.

Fresh or Low Concentration Water

A few years ago if one were to listen in on the average geological conversation in the offices or on the streets of Tulsa—and probably in many other towns in the northern Mid-Continent area—he would probably hear a heated argument on the possibilities of oil and gas in the Forest City basin of northwestern Missouri. This area was very much in the limelight at that time and attention was directed toward it largely because its similarity with the Michigan basin and the Illinois basin, both of which had proven to be productive. There was something different, however, in the Forest City basin and that was that the older formations were known to contain either fresh or low-concentration waters. What did it mean? Some said that it meant there would be no commercial oil fields—and so far at least they have not been disproved. Other companies thought that such a condition was not particularly detrimental and they waived this objection and sent geologists and lease men into the area and later drilled test wells there. In the aggregate, large sums of money were either spent or withheld by various companies largely dependent upon the philosophy or attitude of their geologists toward this question of the influence of fresh water on oil accumulation.

As in the case of source rocks, the interesting fact is that no one has yet shown any demonstrable reason or observation that fresh or low-concentration waters have any significance either for or against the accumulation of oil and gas. In other words, we know nothing about it, yet this lack of knowledge in the form of prejudices—prejudging—translates into untold amounts of money, time, and effort either withheld or spent. A small percentage of the money involved, if applied to research on the question of the function of such waters in oil accumulation, may or may not give the answer, but the problem certainly would be put into a form that the industry could evaluate more correctly than at present and it would not be dependent on half-baked theories, most of which "jelled" while in college.

When oil fields such as some of those in northern Sumatra, in Venezuela, and in our Rocky Mountains, are found to occur associated with fresh or nearly fresh waters, how many others might there be in areas that are now condemned for this reason? There are too many oil fields throughout the world in which oil is being produced along with or in close association with fresh or low-concentration waters to continue our present loose thinking on this subject.

Sedimentation

Sedimentation, with all its related studies, promises to be of increasing importance and one of the key discovery tools of the future. Some of its possible applications have been pointed out and we may well see the day when it rivals structural geology as a way of finding oil.

Yet, we must admit, that in spite of the magnificent work that has been done in the past by the little bank of sedimentationists scattered through some of the college geology departments of the country, we really have made but a start on a workable understanding of the subject as it can be applied to petroleum geology. Every oil field in the world involves sediments of some kind, and those sediments, whatever their character, are more intimately associated with the oil and gas than any other factor. In addition, they either precede or are contemporaneous with the formation of the oil.

In our approach to discovery, however, sedimentation as a practical scientific device to find new oil fields or extend old ones is almost ignored. Probably as good a reason for this lack of appreciation by the industry generally is that the sedimentationists have not yet discovered a way of presenting their ideas in the form of contour maps with some kind of a closed contour symbol indicating the favorable areas for drilling. Let us not forget, however, in spite of this oversight which may some day be corrected, these men have ideas that will in all probability profoundly change our prospecting technique.

Gradually coming into the picture are the quantitative methods exemplified by the work of Krumbein, Pettijohn and Russell; the application to basic problems of oil movement and reservoir conditions as developed by Waldschmidt; the single-handed attack on many of our fundamental problems in petroleum geology that is being made by Krynine; and over it all the balanced thinking of Twenhofel. All of this pioneer work is being done by men in colleges and is without cost to the oil industry. About the only really fundamental work being done by the oil industry on sediments

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Wildcatter's Spirit Must Not Be Crushed

Good prices chief incentive to good morale among wildcatters, which is a big discovery rate factor

By D. J. JONES, State Geologist,
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THE urgent need of increasing our petroleum reserves has been very ably set forth in a recent article (THE OIL WEEKLY, April 5, 1943) by E. DeGolyer, assistant deputy petroleum administrator. With the constant decrease of reserves in our newly discovered fields, in spite of record level geophysical prospecting and core drilling, the industry is faced with an inescapable duty of finding more and more oil if enlarged consumption is to be fulfilled.

The situation becomes especially critical in view of the general belief that practically all large structural features are known and most of them have been tested. This means that smaller features and stratigraphic type traps are to be the source of future oil supply. There seems to be general agreement that the stratigraphic traps, due to beveling and up-dip wedging of permeable formations, must be the chief source of new reserves.

As suggested by DeGolyer, every known method must be employed. The search for and the outlining of stratigraphic type fields will probably necessitate the drilling of an increased number of exploratory wells under the supervision and guidance of the industry's best trained technical experts. However, a very considerable number of these wildcats will be, and should be, drilled by the ordinary independent wildcatter, who has perhaps only a hunch that oil might be found in his chosen spot. In some cases he will be successful, and therefore will play a very important part in the development of an adequate backlog of reserves. His failures, while disappointing, will nevertheless add to the industry's stratigraphic knowledge, thus aiding in the development of the overall picture.

The exploration, say nothing of the development program, will be costly in dollars and cents. But whatever the cost it must be met, and therefore the only question remaining is what is the most practical way of assuring the funds to guarantee the success of the program?

Bonuses and subsidies have been commonly mentioned as the foundation of the exploration program. Either of these methods will result in the setting up of complicated machinery that no doubt will be, in many cases, unfair and impractical. The administration of them will result in unnecessary confusion, and finally the lowering of the morale of a group of men whose patriotic motives are the equal of any other group contributing to the war effort. We cannot afford to crush the spirit of these men, particularly the wildcatter, who by his sheer determination and will to do his part raises the necessary funds and himself contributes his boundless energy to drill the well that may open a new pool. He is truly the fighting man behind the fighting men, and he deserves more consideration than he has been given during the past four years.

Let us consider for a moment what would be on the lips of the Tom Slicks and the legion of wildcatters now gone to their rewards. That army who came up by the route of dirty shirts and overalls would say: Give us the equipment and a fair price for oil and we will place it in the pipe lines.

With all their resources of money and men the major companies at the present, or an advanced price for oil, will not, and cannot, meet the requirements of Secretary Ickes. The job is too large, and the number of exploratory wells as well as interpretation and use of the technical knowledge to be gleaned from the program as it unfolds, presents a task that cannot be properly carried out, even by those large and powerful organizations. The major companies need the wildcatter, and by the same token he needs the support and cooperation of the large producing and refining units.

The huge integrated companies from a financial point of view may survive and produce large amounts of oil under the present price structure. We are treading on dangerous ground, however, if we make it so difficult for the individual operator that he is forced to liquidate or abandon his properties at a time when the country needs him, and most of all needs the few barrels of oil he might produce.

I am reminded of a placard recently placed on the door of a once thriving but now closed grocery store here in the mountains of Kentucky, and more specifically within the boundary of our largest oil field, now capable and ready to produce millions of barrels by secondary recovery methods. It read as follows: "Old Trust is dead, Slow Pay killed him." Unless some drastic stimulant by way of an advance in the ceiling price for crude oil is forthcoming, the wildcatter and the individual operator are in imminent danger of finding themselves buried in the same grave beside "Old Trust."

The oil industry is solidly behind the President in his effort to prevent uncontrolled inflation. No greater catastrophe could overtake us, and it would needlessly prolong the war. Each industry, without faltering, must do its part. It does seem a little strange that we see every effort made to effect parity prices for this and that industry producing the raw and fabricated materials that contribute to the war effort. It is entirely proper, and every fair-minded person should subscribe to the plan. There should be, however, no discrimination.

Due to the increased costs of materials and labor, and as a result of the manpower shortage in all classes, the oil industry finds itself in a very disadvantageous position. Few individual operators and smaller non-integrated companies are receiving enough for their oil to meet their payrolls and lease expenses. In general, the parity price for crude oil is only about 60 percent. This very large group of operators finds itself unable to take part in the wildcatting program so earnestly desired by Secretary Ickes. Likewise, they are unable and perhaps in many cases unwilling to install expensive plants to proceed with secondary recovery operations on their old producing properties. They are justified in not producing their reserves under that price structure.

A blanket raise of 50 cents per barrel is necessary to establish a parity price for crude oil. This increase could in no sense of the word be construed as inflationary.

What will be the net results of a parity price for crude oil? The rapidly waning morale of a large segment of the oil industry will be revived. The present-day wildcatters, worthy successors to those of past generations, and the promoter will become active once more. They will seek funds both in and outside the industry to drill exploratory wells on locations that are obviously good, bad and indifferent.

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Influence of Bacterial Activity On Source Sediments

Research studies show bacteria converts organic matter into substances which are more petroleum-like. Thus it may play an important role in the formation and accumulation of oil. Further study may reveal that bacteria provides clue to detection of present subterranean deposits

By CLAUDE E. ZoBELL
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BACTERIA and allied microorganisms may play an important role in the formation and accumulation of petroleum. They may even provide a clue to the detection of present subterranean deposits.

Although there is no experimental evidence to indicate that bacteria can convert organic matter into crude oil, bacterial activity may promote the process in various ways. Likewise the activities of other kinds of bacteria may prevent the accumulation of petroleum hydrocarbons in certain environments.

What Are Bacteria

Bacteria are simple single-celled organisms having very poorly differentiated protoplasm. It is still indeterminate whether they possess a definite nucleus. With very few exceptions it is impossible to recognize species, or even genera, by their morphological appearance, although their size, shape, cell arrangement, flagella, capsules, granules, endospores, and other structures may be helpful in characterizing bacteria.

Ideally there are three principal morphological types of bacteria: spheres which are called *cocci*, rods which are called *bacilli* and curved rods which are called *vibrio* or *spirilla*. However, most of those occurring in recent sediments are highly pleomorphic, incongruous, bizarre forms which defy description in simple geometric terms. Progeny of the same species may be morphologically as unlike as particles of clay are unlike each other.

They are very small, being only about one micron (1/25,000 inch) or less in diameter. Since bacteria must be differentially stained and magnified about a thousand times to be seen, they escape detection by the microscopes ordinarilly used by the petrologist or paleontologist. In fact, it is very difficult, if not impossible, to recognize bacteria in sedimentary materials, particularly when the latter are rich in organic debris.

Biochemical Activities of Bacteria

Bacteria multiply by transverse fission. Under favorable conditions they may divide every 20 or 30 minutes. At this rate of multiplication the progeny of a single spherical cell, one micron in diameter, would make a mass the size of the earth in three or four days if all survived.

The growth or multiplication of bacteria is limited by a lack of nutrients, unfavorable environmental conditions, natural enemies and by the toxic end-products of bacterial metabolism. Under favorable conditions the ability of bacteria to multiply and to assimilate organic matter is almost unbelievable. About one third of the organic matter which they assimilate is converted into bacterial protoplasm and the rest is oxidized to carbon dioxide and water or intermediate products.

There is virtually no kind of organic matter which is not susceptible to attack by some kind of bacteria, and the intermediate products of metabolism are countless. Bacteria play an important role in soil fertility,[1] and scores of bacterial species are used in industrial processes[2] which require the rapid transformation of organic matter. The importance of bacteria in the carbon, nitrogen, sulfur and phosphorous cycles in nature is well known.

As will be elaborated below, the biochemical activities of bacteria are not restricted to the transformation of organic matter. They have a direct effect upon many minerals and an indirect effect upon more.

In order to demonstrate the presence of bacteria in sedimentary materials, the bacteriologist cultivates them in enrichment cultures until they can be recognized by their mass or biochemical products. The commonest method is to inoculate nutrient media with a known small quantity of the material suspected to contain bacteria. Bacteria may continue to multiply in a clear liquid medium until the latter is cloudy or turbid, or the multiplying bacteria might induce changes in the pH or other chemical properties of the nutrient medium which can be detected.

Sometimes a solid medium in covered dishes (Petri plates) will be inoculated with bacteria. If there are only a few bacteria in the inoculum and they are evenly distributed in the nutrient medium, they may develop into discrete colonies which are a millimeter or so in diameter. The number of colonies which develop is indicative of the number of bacteria present in the inoculum.

It should be obvious that such methods detect only a small percentage of the living bacteria. Several cells sticking together or adhering to a tiny particle will give rise to only one colony and will be counted as only one. Furthermore, the nutrients in the medium, its pH, osmotic pressure, surface tension or oxygen content may be suitable for the multiplication of only a few types of bacteria present. Also the temperature at which the medium is incubated influences the growth of bacteria. Some like it hot and some like it cold.

At their best, nutrient media detect no more than 1 to 10 percent of the bacteria with which we are familiar. There is no basis for estimating what percentage of the bacteria present in new or unexplored horizons will be dedetected by the conventional procedures, but judging from experiences with soil, water or intestinal bacteria, it can be tacitly assumed that the percentage is very low.

A few years ago reports were current that there were few or no living bacteria

on the sea bottom. This conclusion resulted from the failure of investigators to find bacteria from the sea bottom developing in nutrient media which were designed primarily for the growth of soil or fresh-water forms. As new media have been perfected to satisfy the cultural requirements of marine bacteria, more and more bacteria have been found in the sea.

If living bacteria are present in ancient sediments or source beds, their cultural requirements may be as different from those found in recent sediments as marine bacteria are different from fresh-water or soil forms.[5]

Occurrence of Bacteria in Recent Sediments

Although only a very small fraction of the area of the sea floor is represented by the few hundred samples which have been bacteriologically analyzed, it is significant that modern methods of analysis have demonstrated an abundant bacterial flora in all of them.

Thousands to millions of living bacteria per gram of sediment have been recovered from different parts of the ocean floor.[4]

Bacteria have been found in sediments several hundred miles from land and in water depths exceeding three miles. Neither water depth nor distance from land seem to influence the abundance of bacteria in marine-bottom deposits except in so far as these factors influence topographical conditions, which in turn might influence conditions of sedimentation or oceanic circulation.

In general, sediments of small particle size will contain larger bacterial populations than those of larger particle size. A high content of organic matter favors large bacterial populations.

The bacterial population decreases rapidly with core depth.[6] The decrease is an exponential function throughout the topmost 5 to 15 inches, depending upon the rate of sedimentation. Below this depth the decrease is slow and sporadic.

Viable bacteria have been recovered from the bottom of the longest cores examined. The analyses include more than a score of cores exceeding 10 feet in length. The longest core examined was about 17 feet long and represented a penetration of around 25 feet. There were more than 39,000 living bacteria per gram in the lower layer of this particular core. Cores from greater depths must be examined in order to define the limits of bacterial activity in sedimentary materials.

Evidence of Bacterial Activity in Sediments

Merely finding living bacteria present in sedimentary materials fails to prove that they are active *in situ* although this observation constitutes pretty good evidence, particularly since most of the bacteria are not spore formers. It is difficult to believe that the bacteria have been buried in a state of suspended animation for thousands or hundreds of thousands of years.

More convincing evidence of their activity in the sediments is provided by chemical analyses. There is a gradual decrease with depth in the organic carbon and nitrogen content of the cores which is attributable to bacterial activity. Moreover, a relationship has been found between the numbers and kinds of bacteria present and the sulfate content of the sediment aswell as the hydrogen-ion concentration at different core depths.[20]

Theoretically there is no known reason why bacteria could not be physiologically active in recent marine sediments. Nutrient material for food and energy is available as indicated by the fact that when samples of sedimentary material are observed in the laboratory, the bacterial population may increase a ten- to a hundred-fold accompanied by the evolution of carbon dioxide and other chemical changes. The increased bacterial activity which occurs when such samples are stored in the laboratory is partly due to the more favorable temperature and partly due to the oxygenation of the material. Other factors are also involved.

Bacterial Enzymes or Biocatalysts

The role of biocatalysts or enzymes must not be overlooked. Most bacteria produce an abundance of a variety of enzymes, the tools with which bacteria work. The enzymes may continue to be active long after the organisms themselves have ceased to exist. The protective effect of adsorbents such as clay particles together with that of the anaerobic conditions which prevail in recent sediments on the sea floor would tend to preserve the enzymes. Such enzymes might activate or catalyze chemical transformations which otherwise would not occur at ordinary temperatures and pressures.

Organic catalysts of various kinds have been found concentrated in recent marine sediments, including bacterial enzymes which cause the oxidation of organic matter in the absence of bacteria. When buried in sediments, such enzymes might have an almost infinite time to function.

Attention should be devoted to learning more about the quantity, distribution, and properties of enzymes that might influence the conversion of organic matter into petroleum.

Effect of Temperature on the Activities of Bacteria

Most marine bacteria are more active at 60° to 70° F. than at the lower temperatures which prevail at the bottom of the sea. (More than 80 percent of the sea floor is perpetually colder than 40° F., and in places it is colder than 32° F.[8]). Laboratory experiments[6] show that many bacteria multiply and are otherwise physiologically active at temperatures lower than any which occur in the ocean. The rate of activity may be slow at low temperatures, but it will be stopped only when the last trace of water has been frozen solid. Sea water of average salinity starts to freeze at around 28.6° F., and brines freeze at much lower temperatures.

In considering the possible importance of bacteria as geological agents, it is not to be surmised from the preceding discussion that bacteria grow only at low temperatures. Some species have an astonishingly high temperature tolerance. Although a good many bacterial species are killed in 10 minutes by exposure to a temperature as high as 145° F. (the pasteurization temperature of milk), bacteria which survive higher temperatures are quite common. Most spore-formers are not killed at 145° F., and some bacterial species grow at this temperature. Thermophilic or thermogenic organisms have been responsible for the spontaneous combustion of manure piles, haystacks and piles of moist rags. Living microorganisms have been found growing in hot springs at a temperature of 192° F. It remains to be seen if there are organisms which live at higher temperatures.

The bacteria which have been studied respond to temperature according to the van't Hoff rule: their biochemical activities are increased a two- to three-fold for each 10° C. increase in temperature within their range of tolerance.

Effect of Hydrostatic Pressure

It has been argued that the high hydrostatic pressure which prevails at great depths precludes the possibility of bacteria living there. However, living organisms have been recovered from ocean depths exceeding three miles where the hydrostatic pressure exceeds 500 atmospheres or 7500 pounds per square inch. None of the bacteria studied by Larsen and co-workers[7] were injured by pressures of 3000 atmospheres, and many tolerated pressures of 6000 to 12,000 atmospheres.

A high pressure of carbon dioxide or other biologically active gases may be harmful to bacteria, or sudden changes of pressure may be lethal, but it is generally believed that hydrostatic pressure is not a factor which limits bacterial activity in nature. The hydrostatic pressure of the deepest known depression in the sea,[8] the Minandao Deep which is 35,400 feet below sea level, is only 1100 atmospheres. At depths in the earth's crust where such pressures exist,

the temperature is probably too high to be compatible with life of any kind.

Effect of Osmotic Pressure

Marked differences exist in the salt tolerance or osmotic pressure requirements of bacteria. Only a small percentage of the bacterial flora of soil or fresh-water environments can live in sea water.[3] (The average salt content of sea water is 3.4 percent, or 34,000 parts per million, a large proportion of which is sodium chloride.[8]) Doubling the salt content of sea water by evaporation discourages the growth of many marine bacteria but there are some which thrive in concentrated salt solutions.

The high salinity or osmotic pressure of brines associated with petroleum deposits will not prevent the growth of halophilic (salt-loving) bacteria. Such organisms abound and are physiologically active in brines.[9] They occur in the Dead Sea[10] and in Great Salt Lake.[11] The salinity of these bodies of water ranges from 25 to 30 percent. Halophilic bacteria are also found in marine salterns from which salt is crystallizing.

Provided organic matter and moisture are present, no brine is too concentrated for the growth and biochemical activity of halophilic bacteria. There are many kinds of halophilic bacteria which are physiologically versatile.

Kinds of Bacteria

While it is necessary for the bacteriologist to know the generic and species names of bacteria, for present purposes it is preferable to characterize them according to their physiological activities. Facultative aerobes, or those which are active either in the presence or in the absence of free oxygen, predominate in marine-bottom deposits. A few are strict anaerobes which can live only in the absence of free oxygen.

Most marine bacteria are proteolytic, being able to decompose purified as well as natural plant or animal proteins. A good many are saccharolytic, attacking sugars, starches and even cellulose. Some lipolytic bacteria oxidize fats to carbon dioxide and water, but most of them merely hydrolyze the fats and vegetable oils. The resulting glycerol is often oxidized as a source of energy while the fatty acids accumulate. An anaerobic or reducing environment favors the accumulation of the fatty acids liberated by the bacterial hydrolysis of fats and oils.

As stated above, there are bacterial species which can attack nearly any kind of organic matter, including such substances as chitin, lignin, hemicellulose and humus. Of course, there are very few bacterial species which will attack such complex substances and the rate of attack is very slow.

Marine sediments generally contain an appreciable number of bacteria which can reduce nitrates or sulfates. Others activate the transformation of several inorganic or mineral constituents of sediments as noted below.

Effect of Bacteria on the pH of Sediments

Bacteria are probably the principal dynamic agents which are responsible for changes in the hydrogen-ion concentration, or pH, of sedimentary materials.[30] Depending upon the numbers and kinds of bacteria present, the substrate and other environmental factors, bacteria cause the pH to increase or to decrease.

The pH is decreased, or the environment is made more acidic, by bacteria which produce carbon dioxide, oxide organic matter to organic acids, produce nitrites or nitrates, oxidize hydrogen sulfide or sulfur to sulfate or which utilize ammonia. As an extreme example of the ability of certain bacteria to lower the pH may be mentioned a well-known soil organism, *Thiobacillus thiooxidans*, which may continue to oxidize sulfur until the pH falls to less than 1.0. It may produce the equivalent of N/10 sulfuric acid.

Although the pH of sediments may not be greatly reduced, the acid produced by bacterial activity may dissolve calcium carbonate, thereby rendering limestone more porous[12] and retarding the lithification of unconsolidated sedimentary materials. The acid may alter the state of other mineral constituents as well as influencing chemical reactions of various kinds.

Other bacteria increase the pH by the liberation of ammonia from nitrogenous compounds, by the utilization of carbon dioxide or organic acids or by the reduction of sulfates. These bacteria favor the formation of limestone and the cementing action of calcium carbonate.

A high pH favors the preservation of calcareous fossils, a low pH tends to destroy them. The pH also influences the oxidation-reduction potential.

Effect on the Oxidation-Reduction Potential

Bacteria tend to create reducing conditions, or to lower the oxidation-reduction (redox, for short) potential[32] of marine sediments. Whereas sea water itself may be slightly oxidizing in character,[34] bottom deposits may be as reducing as Eh —0.2 to —0.5 volts. The latter is more reducing than the theoretical hydrogen electrode. Such reducing conditions favor the hydrogenation or reduction of organic matter and the preservation of reduced organic matter such as petroleum hydrocarbons, for example.

As a rule marine sediments become more reducing with core depth.[35] Little is known concerning the redox potential of producing horizons although petroleum itself is quite reducing in character. Recently we have found samples of oil shale, prepared for us under the supervision of Dr. K. C. Heald of Gulf Oil Corporation, to be very reducing, although it was exposed to air during the preparation of the samples.

The redox potential of sediments has a pronounced effect upon the direction, velocity and magnitude of chemical reactions which involve the exchange of electrons, or the oxidation or reduction of reactants. Whether iron occurs in the ferrous or ferric state and whether manganese occurs in the manganous or manganic form is largely a function of the redox potential of the environment. The form of other minerals as well as that of organic matter is influenced by the redox potential.[36]

Both the reducing *intensity* and the reducing *capacity* must be taken into consideration.

Effect of Bacteria on Gas Tension

Most bacteria consume oxygen. Consequently they will tend to deplete the free oxygen from a system in which the oxygen supply cannot be replenished from the atmosphere or by photosynthetic activity. This is what happens in marine sediments. Most marine muds contain no dissolved oxygen and they usually have an oxygen deficit. This is shown by the fact that upon mixing with oxygenated water, large quantities of oxygen are instantaneously taken up by the mud.[35] The same is true of the oil shales mentioned above.

Carbon dioxide is produced by most bacteria which oxidize organic matter, and it is utilized by a few. Similarly carbon monoxide is produced by some bacteria and consumed by others. The carbon dioxide and carbon monoxide which occur in marsh gas, and maybe other kinds of natural gas, are quite likely bacterial products.

Denitrifying bacteria liberate free nitrogen from nitrates and nitrites. This reaction appears to be quickly completed in recent sediments because neither nitrates nor nitrites are found, although both may be present in the overlying water.

Methane is produced from most kinds of organic matter by certain bacteria. There is voluminous literature on the factors which influence the bacterial production of methane.[17,18] Maxon[19] has attributed the gas pits in sediments to the production of methane from organic matter by bacteria.

Bacterial Production of Hydrogen

Certain theories of petroleum formation require the presence of hydrogen.[37a]

Whether bacteria produce it where needed for petroleum formation is still indeterminate, but considerable hydrogen is produced in recent sediments from the anaerobic decomposition of organic matter.[18] After prolonged incubation under anaerobic conditions, up to 12 percent of the organic content of lacustrine sediments was found[20] to be converted into gaseous products consisting of 65 to 85 percent methane, 3 to 30 percent carbon dioxide, 3 to 22 percent nitrogen and 1 to 3 percent hydrogen.

We have noted the presence of appreciable quantities of hydrogen as well as methane in freshly collected sediments from the Gulf of California.

The anaerobic fermentation of organic matter by bacteria usually results in the liberation of a certain amount of hydrogen. Several species of bacteria are endowed with this ability. The hydrogen is probably liberated in the nascent form which is more reactive chemically than molecular hydrogen.

Effect on Chemical Composition of Sediments

The quality and quantity of organic matter are influenced by bacterial activity. In shallow, well-oxygenated, sandy bottoms most of the organic matter may be completely mineralized, whereas in other regions the organic matter may merely be fermented or reduced. A multiplicity of interrelated factors including the rate of sedimentation, oceanic circulation,[8] pH, redox potential, oxygen content, temperature, the kinds of bacteria present, the nature of the organic matter, the occurrence of specific inhibitors,[32] etc., influence the transformation or organic matter.

Exploratory observations indicate that the oxidizability (by bacteria) of organic matter decreases with core depth, or with the geological age of the material.[41] Because the susceptibility of organic matter to bacterial oxidation is believed to be of importance in characterizing source sediments, efforts are being made to perfect methods for ascertaining the bacterial oxidizability of organic matter in sedimentary materials.

The effect of bacteria on the nitrate, sulfate and carbonate content of sediments as well as their effect on compounds of iron and manganese has already been mentioned.

Besides producing hydrogen sulfide from the reduction of sulfates, this substance may also be produced by the bacterial decomposition sulfo - proteins. There is evidence that under certain conditions sulfates may be reduced to elementary sulfur, and sulfur may be formed by the oxidation of hydrogen sulfide. Thiosulfates may react with hydrogen sulfide to give sulfur, and other chemical reactions might oxidize hydrogen sulfide to sulfur.

Although a high concentration of hydrogen sulfide is toxic for most organisms, many bacteria are able to oxidize it to sulfur. However, most of the bacteria which are known to cause this reaction do so only in the presence of free oxygen or radiant energy.[21]

Particle Aggregation

Many marine bacteria[22] directly or indirectly produce calcareous cements which may tend to accelerate the diagenesis, lithification or consolidation of sedimentary materials. They also produce mucilagenous exudates or capsular substances which adhere to particles or which cause the particles to adhere to the bacteria. The aggregation of particles of clay, silt or sand hastens the rate of sedimentation and influences the structure of the resultant bottom deposits.

The bacteria themselves have an affinity for solids, and a tendency to attach themselves to particulate materials.[25] Filamentous cells weave particles together with an intricate meshwork. The extent of the binding action depends primarily upon the types of microorganisms present and the quality of the organic matter.[24, 25] While there may not be enough living cells present to have any appreciable binding effect, there are probably thousands of times as many dead and partly decomposed cells as the number of living cells which can be demonstrated. An acre-foot of soil or marine mud might contain a ton or more of living microorganisms.

Do Bacteria Produce Petroleum?

It is doubtful if organic matter is converted directly into crude oil by bacterial activity although certain petroleum hydrocarbons are produced by bacteria. However, bacteria in recent sediments do tend to transform organic matter into substances which are more petroleum-like. This they do by reducing the oxygen, nitrogen, phosphorous and sulfur content of organic matter as indicated by the proximate analyses of organic matter from different petroliferous environments:

Source of Organic Matter	Carbon Percent	Hydrogen Percent	Oxygen Percent	Nitrogen Percent	Phosphorus Percent
Marine sapropel	49	5	40	3.4	0.8
Recent sediments	58	7	34	2.2	0.6
Ancient sediments	73	9	14	0.9	0.3
Crude oil	85	13	0.5	0.4	0.1

The bacterial reduction of the oxygen, nitrogen, phosphorous and sulfur content of organic matter can be demonstrated in the laboratory. The liberation of fatty acids by the bacterial hydrolysis of fats and vegetable oils has already been mentioned. It would be necessary only to remove two oxygen atoms from the fatty acids to give fairly long-chain hydrocarbons. There is evidence that certain anaerobic bacteria convert fatty acids into non - saponifiable materials consisting of hydrocarbons and sterols.

Investigations are now in progress at Pennsylvania State College, as part of API Research Project 43B, to ascertain whether bacteria isolated from sedimentary materials can deoxygenate or decarboxylate fatty acids. The only hydrocarbon found by Thayer[26] to result from the anaerobic decomposition of fatty acids was methane, but Russian workers[27] report the formation of a mixture of liquid hydrocarbons, balkhashite, from the anaerobic fermentation of fats. According to Ginzburg-Karagicheva[28] anaerobic bacteria produce several kinds of both saturated and unsaturated hydrocarbons. These observations await confirmation by further work.

Pigmented Hydrocarbons

Some bacteria synthesize carotene or other hydrocarbon - like pigments.[29] As much as 0.005 to 0.016 percent of the dry weight of pigmented bacteria may consist of carotene. Smaller quantities of leprotene are produced. When it is considered that approximately one third of the organic matter assimilated by bacteria is converted into bacterial cell substance, it becomes evident that significant quantities of carotene or allied pigmnets may be produced by bacteria.

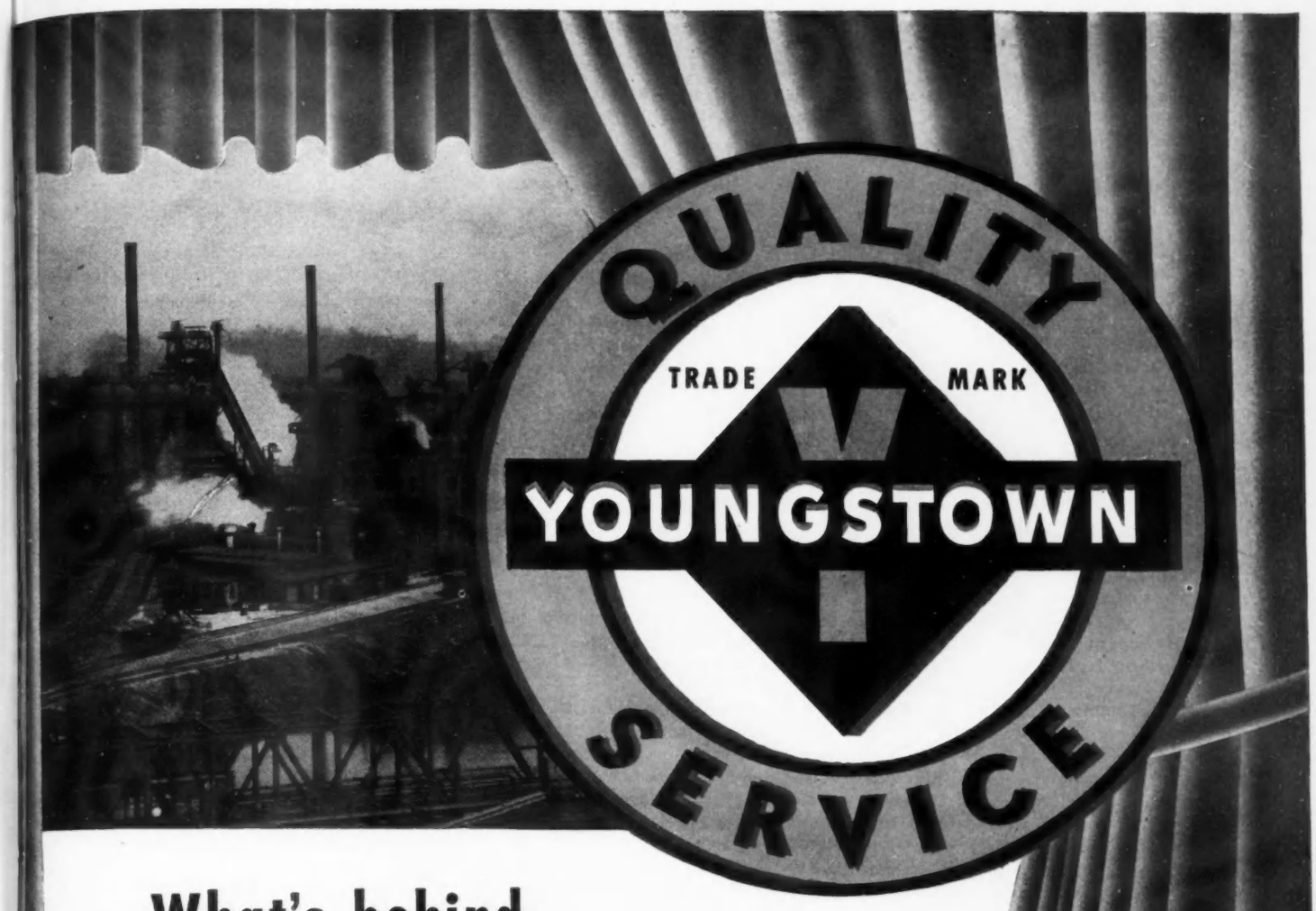
It is not inferred that crude oil results from the catalytic or thermogenic cracking of carotenoid pigments. The point is that if bacteria can synthesize such complex hydrocarbons as carotene or leprotene, they may synthesize simpler hydrocarbons.

The occurrence of plant pigments in petroleum has often been cited as supporting evidence for the plant origin of oil.[30] This may be true of certain carotenoid pigments, and quite certainly it is for the chlorophylloid pigments, but cognizance must be taken of the fact that bacteria produce carotene, using either plant or animal organic matter as the energy source.

Methane May Be Polymerized

It is estimated that bacteria produce enough methane to account for all known petroleum deposits if it can be shown that methane is polymerized in source sediments. Some combination of pressure, temperature, time and catalysis may tend to polymerize methane.

Possibly radioactivity activates the polymerization of methane.[17a] Part of API Research Project 43C at the Massachusetts Institute of Technology is concerned with the effect of (a) alpha radiations of radon, (b- deuterons and (c) neutrons upon the transformation of



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"proto-petroleum." Interesting results have already been achieved.

There are bacteria which utilize methane, converting much of it into bacterial protoplasm. Theoretically, it should be possible for bacteria to polymerize methane to form higher hydrocarbons. An investigation of the possibilities is under way at the Scripps Institution of Oceanography as part of API Research Project 43A.

Bacteria Destroy Petroleum Hydrocarbons

Bacteria have been found in marine sediments, brines, crude oil and soil which can oxidize nearly all kinds of mixtures or purified hydrocarbons which have been tested.[29] In general, long-chain hydrocarbons are oxidized more readily than those of smaller molecular weight, and aliphatic compounds are more susceptible to bacterial oxidation than cyclic or aromatic hydrocarbons. Compounds with unsaturated bonds appear to be attacked more readily than saturated homologs, and iso- or branched-chain compounds appear to be oxidized faster than normal hydrocarbons.

These generalizations are based upon observations on only about 50 different compounds, and may be revised when more highly purified hydrocarbons are subjected to critical tests. Readers are invited to direct the attention of the author to sources of highly purified hydrocarbons which are not generally available.

Numerous species representing half a dozen genera of bacteria are endowed with the ability to utilize certain hydrocarbons. All of them produce carbon dioxide and bacterial protoplasm as end-products of the reactions, and some produce methane or its homologs, organic acids, alcohols or ketones.

Most of the hydrocarbon-oxidizing bacteria require the presence of free oxygen, although other substances such as nitrates or sulfates may serve as the source of oxygen. The ability of bacteria to oxidize petroleum hydrocarbons under anaerobic conditions is being carefully investigated. If hydrocarbons are oxidized anaerobically, the reaction is much slower than under aerobic conditions.

Although the reaction will take place in an aqueous system, the presence of sand, silt, diatomaceous earth or other particulate adsorbents accelerates the bacterial oxidation of hydrocarbons. When mixed with 100 grams of marine sediment, as much as 1 gram of crude oil might be oxidized by aerobic bacteria in 40 days at 70° F.

The hydrocarbon-oxidizing bacteria grow best at temperatures ranging from 65° to 85° F., although some are active at temperatures as low as 32° F., or as high as 130° F. No attempts have been made to cultivate hydrocarbon-oxidizing bacteria at higher or lower temperatures.

Crude Oil Is Attacked by Bacteria

Six different samples of Kern County (California) crude oil supplied to us through the courtesy of General Petroleum Corporation have been found to be attacked by bacteria in an aqueous system. The bacteria grow in the water at the expense of the overlying oil. The reaction is accelerated by the addition of sand.

It is claimed by some[35] that crude oil acts as an "embalming" fluid which provides an aseptic environment for the preservation of biological materials. Unquestionably crude oil from most fields inhibits the activities of many kinds of bacteria, and it is often bactericidal, but crude oil is not universally anti-bacterial. Living bacteria have been recovered from crude oil. Sedimentation ponds and oil-soaked soil are the best places to find large numbers of hydrocarbon-oxidizing bacteria.[29]

While extensive bacterial activity within crude oil seems improbable, bacteria could be active in the water bordering the oil.[42] Work is now in progress to ascertain whether such bacteria could obtain their oxygen requirements from sulfates or from other compounds. If so, the depth to which they could be active would be limited primarily by the temperature, although some crude oils may prove to be toxic. It is desirable to examine petroleum samples, oil-bearing sands, oil shale, oil-well brines and sources sediments from various regions to see if any *per se* provide an aseptic environment.

The continuous action of bacteria upon petroleum may tend to break large molecules of hydrocarbons down into smaller molecules with the formation of increasing quantities of methane, carbon monoxide and carbon dioxide. The latter might be converted into carbonate in a slightly alkaline environment. Aliphatic and olefinic compounds might be preferentially attacked, depending upon the kinds of bacteria present.

HC-Oxidizing Bacteria Inhibited by Hydrogen Sulfide

Concentrations of hydrogen sulfide as small as M/100,000 retard the bacterial oxidation of petroleum hydrocarbons, and ten times this concentration is inhibitory. It is not yet known whether metallic sulfides such as pyrite, for example, are inhibitory. The inhibitory action probably depends upon the ionization of the sulfides which is largely a function of the pH.

Carbon monoxide, heavy metals and other substances inhibit the bacterial oxidation of hydrocarbons in concentrations which might occur in certain source sediments. Perhaps the presence of inhibitory substances or conditions is prerequisite to the accumulation of petroleum hydrocarbons in recent sediments. Various source sediments, oil sands and oil shales are being examined for the presence of inhibitors. It must be taken into consideration that such inhibitors as hydrogen sulfide might be destroyed or inactivated upon exposure to the air. Therefore it is necessary to focus attention upon conditions *in situ*.

Petroleum Hydrocarbons in Nature

Large numbers of hydrocarbons including heptane, pentadecane, hexadecane, eicosane, heneicosane, docosane, tricosane, pentacosane, hexacosane, heptacosane, octacosane, nonacosane, triacontane and pentatriacontane, besides the previously mentioned pigments, occur naturally in certain plants and animals which have been examined.[17a, 33, 34] Sanders[36] relates that 4 to 6 percent of the dry weight of the candeilla plant consists of wax, and 40 to 60 percent of the wax is hentriacontane. The guayule plant and the rubber tree also are rich in hydrocarbons, chiefly isoprene.

If preserved and entrapped, the naturally occurring hydrocarbons of plants and animals would be more than enough to account for the known deposits of petroleum. Perhaps the hydrocarbons have been destroyed in all except certain environments where conditions are inimical to the activity of hydrocarbon-oxidizing bacteria. Although the writer does not believe that all crude oil deposits have had such an origin, preserved hydrocarbons of plant or animal origin might account for some of the oil.

Regardless of their role in petroleum genesis, hydrocarbon-oxidizing bacteria must be taken into account in examining recent sediments for hydrocarbons, or in experiments designed to show how hydrocarbons are formed.[29] The presence of such bacteria may explain why Thayer[38] found no hydrocarbon except methane resulting from the fermentation of fatty acids by mixed cultures. While there is no reason to believe that higher hydrocarbons were produced, it is conceivable that some might have been produced and destroyed simultaneously by hydrocarbon-oxidizing bacteria.

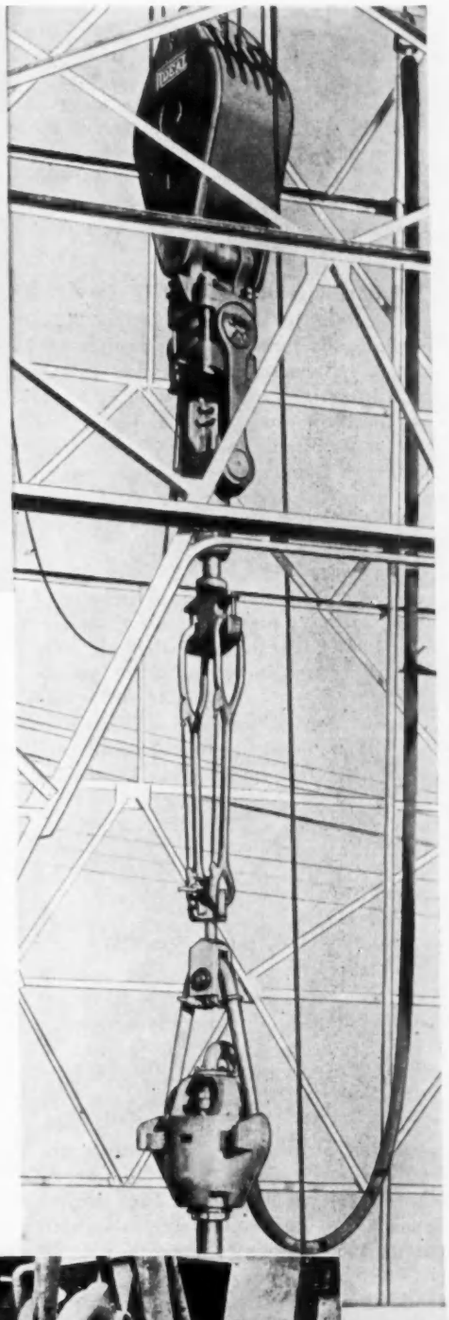
Hydrocarbons in Marine Sediments

The activity of hydrocarbon-oxidizing bacteria may explain why Trask[31] and others have failed to find petroleum hydrocarbons in recent sediments. Even if hydrocarbons were in the sediment *in situ*, they might be destroyed rapidly by the increased bacterial activity which results from the collection and storage of sediment samples.[32]

Recently Dr. Herbert F. Haas work-

Development of New Crude Oil Reserves—

to Meet the National Emergency



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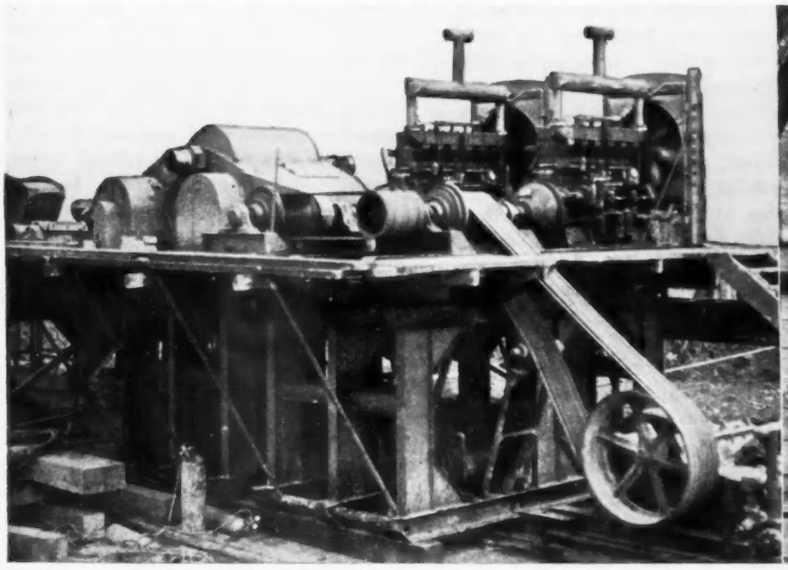

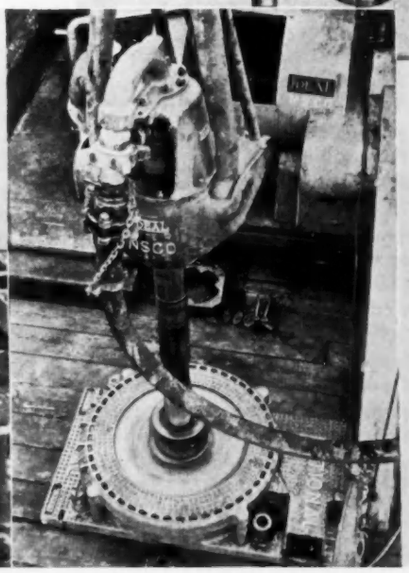

ing in our laboratory has detected 10 to 20 mgm. of liquid hydrocarbons in 100-gram samples of recent marine sediments. During a few days storage at room temperature much of the oil disappeared, ostensibly due to bacterial activity. The observations are being continued. Finding more oil in some sediments than in others might furnish a clue to the origin of oil.

Microbiological Prospecting for Oil

As might be expected, hydrocarbon-oxidizing bacteria are most abundant in oil- or gas-soaked soil. Several million such bacteria per gram have been found by Haas[26] in crude-oil-soaked soil from Kansas, Louisiana and Texas. They have also been found around leaking natural gas mains[26, 27] in sufficient numbers to alter materially the chemical composition of the surrounding soils.

If volatile hydrocarbons are slowly escaping from subterranean deposits of petroleum they may be oxidized by bacteria in the surface soil which is oxygenated. There may be tests for the bacterial oxidation products of hydrocarbons which are much more sensitive than the conventional geochemical tests. Colorimetric tests which can be rapidly and inexpensively made in the field have been proposed by Blau[28] as a supplementary method of prospecting for oil. The specificity of the tests is yet to be established.

API Research Project 43A

Further information on the mechanism of and conditions requisite to petroleum formation and accumulation may provide important clues to the location of producing horizons. To gain such information is the chief objective of Research Project 43 on the "Transformation of organic matter into petroleum" which is sponsored by the American Petroleum Institute. The Project consists of three closely integrated parts. Bacteriologists, chemists, physicists and geologists at the (A) Scripps Institution of Oceanography, (B) Pennsylvania State College and (C) Massachusetts Institute of Technology are working cooperatively on various aspects of the problem.

"The immediate field of attack will include the occurrence, formation and transformation of hydrocarbons under the influence of bacteria and suitable types of radiations. The organic matter will be selected as far as possible because of its presumed relation to petroleum deposits or their source beds." Since it is generally believed that most petroleum originated in marine environments, the emphasis will be upon marine materials, but terrigenous and lacustrine materials will not be overlooked.

Research Program

Work along the lines summarized in the foregoing pages has been in progress at the Scripps Institution for several years.[29] Impetus has been given to these studies by the sponsorship of the API which, since July, 1942, has been contributing approximately one third of the annual costs. Of far greater importance than the financial assistance is the cooperation with the workers at Pennsylvania State College and MIT and the API Advisory Committee consisting of a score of petroleum geologists who represent the participating companies. The active interest and cooperation of petroleum geologists and production men all over the country can do much to expedite the research work.

Our part of the program, Project 43A at the Scripps Institution, calls for examining recent and older sediments for the presence of bacteria and for environmental conditions which might influence their activities. Laboratory experiments are in progress on the action of microorganisms upon organic matter under conditions designed to simulate those in nature. The effect of various kinds of bacteria upon petroleum hydrocarbons is receiving special attention. We are also responsible for obtaining the necessary samples of sediments and other marine materials for the other two parts of the project.

Need of Special Samples

At the present time it is not feasible to collect cores longer than 10 to 20 feet from the bottom of the sea. Therefore in order to obtain older sediments, attention is being given to oil-well borings in order to define the lower limits of the biosphere. Reports are current of recovering living bacteria from five- to six-thousand foot oil wells but there is some question whether they are adventitious or autochthonous species.

To be useful for bacteriological or biochemical analyses, samples of brines, oil sands, crude oil or cores must be collected *aseptically* and delivered *promptly* to the laboratory. Directions for the collection and shipment of samples may be obtained from Dr. G. C. Gester, Standard Oil Company of California, San Francisco, or from the geological co-director of the project, Dr. W. P. Rand, Gulf Oil Corporation, Pittsburgh.

Further ideas for the *aseptic* collection of samples from oil wells are solicited. If the engineers can collect suitable samples, we can analyze them. It is important to know whether bacteria are merely instrumental in transforming organic matter and affecting environment conditions in recent sediments or if they continue to function at greater depths in older sediments.

Summary and Conclusions

Due to their small size the biochemical activities of enrichment cultures of bacteria are more useful than their morphological appearance for characterizing bacteria. In spite of their small size, bacteria multiply so rapidly and they are so active physiologically that under favorable conditions they may be responsible for chemical reactions of considerable magnitude.

Some of the difficulties of enumerating and identifying the bacterial population of sediments are discussed.

Significant numbers of living bacteria have been found in recent marine sediments. They occur in ocean depths exceeding 3 miles and in core depths as great as 17 feet.

Stratigraphic changes in the organic and sulfate content of cores indicate that the bacteria are active *in situ*. There is evidence that they could be active within wide ranges of temperature, hydrostatic pressure or salinity.

Numerous bacterial species are found in marine sediments which are physiologically versatile, varieties occurring which can attack virtually any kind of organic matter as well as some bacteria which transform certain mineral components of sediments. Most of the bacteria are facultative aerobes which are able to live in either the presence or the absence of free oxygen.

By producing either acids or bases, bacteria influence the pH of sediments which in turn affects chemical reactions, the precipitation of calcium carbonate, the porosity of limestone or the preservation of calcareous fossils.

Bacteria tend to create reducing conditions in marine sediments. Reducing conditions favor the formation of petroleum hydrocarbons and may influence the state of iron or manganese.

Oxygen is depleted from bottom deposits very early in their history by bacterial activity. Most bacteria produce carbon dioxide and some form carbon monoxide. Methane-producing bacteria are widely distributed in the sea.

Significant quantities of hydrogen are produced from the anaerobic decomposition of organic matter.

There are several kinds of bacteria which transform sulfur and its compounds. Sulfates are reduced, sulfur is liberated and hydrogen sulfide is produced, depending upon the bacterial flora and the environmental conditions.

Bacteria may influence the aggregation of particles and the lithification or consolidation of sediments in a variety of ways.

Although bacteria may not produce petroleum directly, they convert organic matter into substances which are more petroleum-like by reducing the oxygen, nitrogen, sulfur and phosphorus content. It is well known that bacteria produce methane and some produce complex pigmented hydrocarbons such as carotene. Bacteria can convert methane

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into bacterial protoplasm and they may be able to polymerize it to form higher hydrocarbons.

Many bacteria liberate fatty acids from fats and oils. The removal of two atoms of oxygen from the fatty acids would result in the formation of fairly long-chain hydrocarbons.

Some bacteria destroy petroleum hydrocarbons, and these may be responsible for the failure of workers to find petroleum hydrocarbons in recent sediments or in experimental material with mixed cultures. This reaction might occur during the transportation and storage of samples preparatory to their analyses, or it might occur *in situ* in all except certain environments which are unfavorable to the activity of the hydrocarbon-oxidizing bacteria.

Hydrogen sulfide, certain heavy metals and other substances inhibit the activity of hydrocarbon-oxidizing bacteria.

Changes produced by hydrocarbon-oxidizing bacteria in surface soil over subterranean petroleum deposits from which volatile hydrocarbons are escaping may serve as useful indicators in prospecting for oil.

Although unquestionably geophysical and geochemical processes play an important role in petroleum formation, the influence of bacterial activity upon the formation of proto-pertoleum and especially upon environmental conditions must not be disregarded. The extent and depth to which bacteria continue to be active is a problem for further investigation. Complete information may provide further clues to the discovery of oil deposits.

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Discovery Thinking

[*Continued from page 13*]

is with clays, and then only because of their application to drilling muds.

An inkling of what is ahead of us in sedimentation was well stated by Payne in a recent issue of our own bulletin[1] as follows:

"It is now coming to be realized that he future must bring a new form of stratigraphic research, middle-road research which will bridge the gap between the *old stratigraphy* and the *new stratigraphy* that is now unfolding. This middle-road policy will call for complete restudy of the stratigraphic record and for lithologic descriptions and environmental interpretations which recognize and evaluate in simple semi-quantitative manner the fundamental attributes, properties, and structures of sediment and the environmental factors and sedimentational processes which control its genesis.

" . . . The new stratigraphy must include a breakdown of the stratigraphic record into lithologic and environmental types and their varieties and must place emphasis on *lithologic classification* as well as stratigraphic classification."

A real understanding of sediments would probably do more than any other single factor to improve the geological interpretations which are put on geophysical data and in like manner it would improve the speculative geology which is necessary in all subsurface studies. Would it not be wise for the oil industry, either collectively or individually, to set aside even an infinitesimal fraction of its discovery costs to gain a better understanding of one of the very few factors common to all oil fields? Especially since our present knowledge has merely touched the fringes of a phase of geology, the applications of which even now give indication of being critical to much of our future discovery thinking.

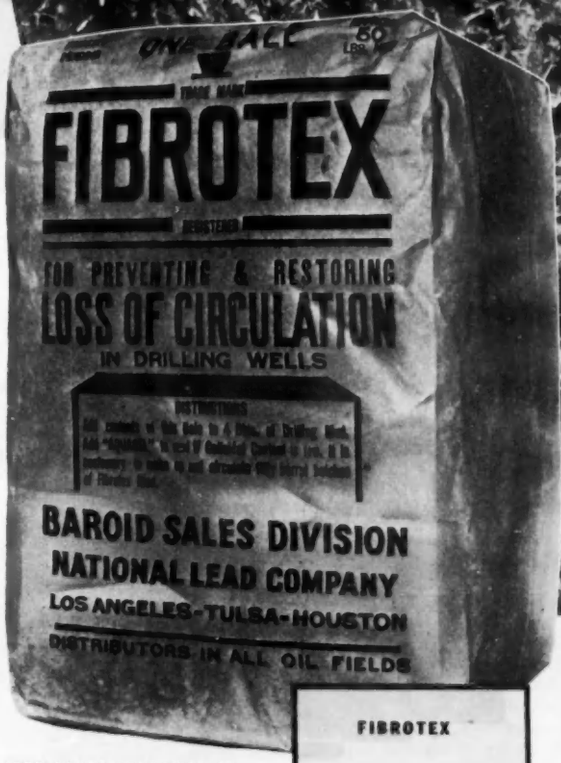
A very practical and natural question in times such as these is where to find the men to do the geological work which has been described. There is probably no complete answer until the war is over. There are, however, several partial solutions, which taken together may help to tide over the situation. They are:

First: "First things first." When the problem of first importance becomes the discovery of new oil fields and not the development of old ones, there will be many geologists now doing routine or "hack" geology in local areas who can be advanced to the more important

[1] Thomas G. Payne, "Stratigraphical Analysis and Environmental Reconstruction," Bull. Amer. Assoc. Petrol. Geol., Vol. 26, p. 1698, November 1942.

FIBROTEX

PREVENTS OR RESTORES LOST CIRCULATION IN GRAVELLY, FRACTURED OR CREVICED FORMATIONS



FIBROTEX is a scientifically prepared fibrous material which, when added to rotary drilling fluid, prevents or restores lost circulation. It takes the place of beet pulp, cottonseed hulls, straw, etc., and is especially effective in gravelly, fractured or creviced formations either before the thief formation is encountered or after circulation is lost. FIBROTEX-laden mud, by reason of its sealing ability, will often eliminate the necessity for a cement job.

Because fibers of uniform size are not sufficient to seal all formations, FIBROTEX is manufactured with both small and large fibers intimately mixed to meet all conditions successfully.

FIBROTEX is economical because it need not be added to all the mud in the system; a slug of the fiber-laden mud can be placed opposite the anticipated or encountered loose formation and may prevent all additional trouble.

FIBROTEX is non-abrasive and non-corrosive and can be kept in storage without deterioration. When mixed with mud, it can be held in reserve without losing its efficiency. FIBROTEX is furnished in paper-wrapped bales containing approximately 50 pounds. One bale will treat four barrels of mud and 50 barrels are generally sufficient for a single treatment. Should a seal be obtained before all the 50 barrels are used, the remainder may be stored for future use.

You can make hole faster, and at less expense, with FIBROTEX and other Baroid Products.

FILTER CAKES DEPOSITED ON A POROUS MEDIUM BY THREE FIBER-LADEN MUDS. Note comparative thinness of FIBROTEX cake on ¼" gravel at 3000 pounds per square inch. This illustrates its value in restoring circulation. Because of the thickness of the cottonseed hull and the beet pulp cakes they are more apt to be dislodged by the passage of tools than the FIBROTEX cake.

BAROID SALES DIVISION

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BAROID SALES OFFICES: LOS ANGELES • TULSA • HOUSTON

BAROID PRODUCTS: BAROID AND COLOX, AQUAGEL, FIBROTEX, BAROCO, STABILITE, AQUAGEL-CEMENT, SMENTOX, ZEOGEL, IMPERMEX, MICATEX, TESTING EQUIPMENT, BAROID WELL LOGGING SERVICE

creative job of discovery in new areas. They can be put into the field or they can be trained to interpret, in terms of discovery, some of the data, collection and filing of which is their chief concern.

Second: Many is the consulting geologist with a background of experience and with the technical ability to take on problems such as have been described. The discovery showing which they as a group continue to make with the small amounts of information, equipment, and money they have available, strongly suggests that with more data to work with they would have commensurately greater results.

Third: With the falling off in college enrollments in geology departments there are many instructors, assistants and professors who will be available for commercial engagements. There are literally thousands of special geological reports of the type suggested above, waiting to be made and which they can do equally well or even more intelligently than the strictly commercial geologist.

Conclusion

In conclusion, what has been said resolves into the simple statement that the oil industry is by-passing an important discovery tool. It has attempted to mechanize, routinize and standardize what DeGolyer has so aptly termed the "art of discovery"—an inherently individualized and infinitely variable process—and the job is not being done. The proposal is to return to geology as such, but on a much higher scientific level than heretofore. As a discovery tool, there is enough geology now rusting away in the sheds of our filing cabinets and in the background of our thinking to cultivate a really substantial and continuous crop of new oil fields. We have, in the form of more geological observation, more geological reasoning, and more geological understanding, tools that will take hold as our present methods let go, and they are fully able to carry, not only the geologist but the oil industry itself, to new levels of achievement. Moreover, the United States is the great proving ground for exploration ideas and the problems we have here and the solutions we get become the guide to discovery throughout the world. If we are but encouraged and permitted to exercise our latent abilities we can do much toward lifting the clouds of doubt and uncertainty concerning our oil supplies, which have settled round about us.

This means that we must think discovery if we are to achieve it.

Wildcatter's Spirit

[*Continued from page 14*]

These men who are willing to risk their last dollar in a wildcat test are not interested in bonuses or subsidies. The very best aid to these men for securing the funds to drill is to make it possible for them to guarantee their customers a price for their crude oil that will insure them a fair return on the gamble they are taking.

Some of these tests will open pools in areas where the best minds of the industry would not recommend drilling. The failures in many cases will provide the necessary scientific data that will lead to the discovery of other pools in the general area. The larger companies will likewise step up their exploratory programs. The operators, big and small, will immediately inaugurate secondary recovery operations in their partially depleted fields, and pressure maintenance operations in newly discovered pools will be the rule rather than the exception. Parity price for crude oil will therefore assure an adequate supply of oil for civilian and war needs. It will stabilize, and, even in the face of unprecedented demands for crude, add to our declining reserves.

Finally, "Old Trust" will experience a resurrection, and thus the beneficial cycle resulting from a parity price for crude oil is completed.

NEEDED: More Oil

Global warfare calls for more and more petroleum. The oil industry *can* and *will* produce whatever is necessary to win this war. If your business can use additional financing for war production, you'll find us ready to cooperate.

REPUBLIC NATIONAL BANK
OF DALLAS
MEMBER FEDERAL DEPOSIT INSURANCE CORP

ONE OF THE NATION'S 100 LARGEST BANKS

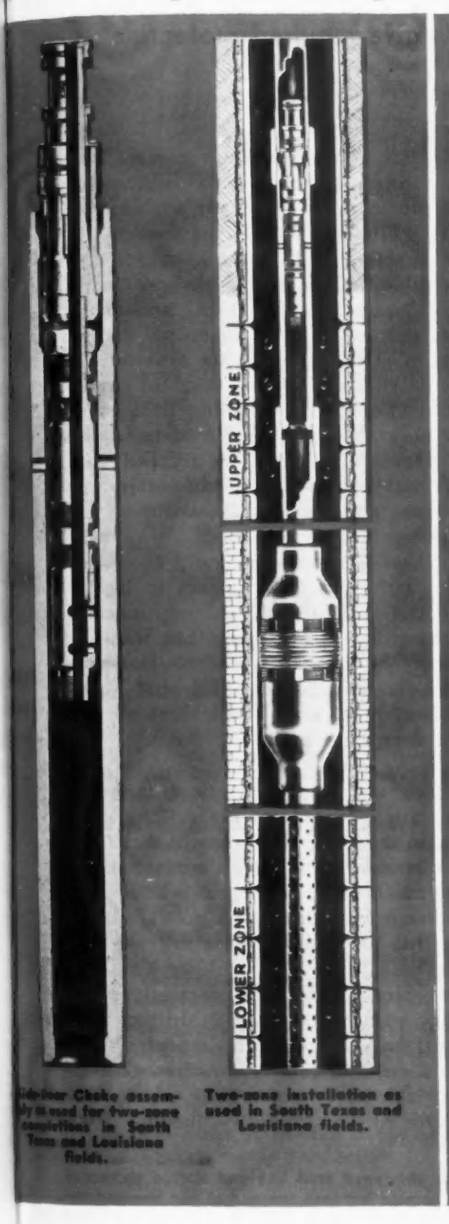
OTIS PRESSURE CONTROL SERVICE – EQUIPMENT

Sub-Surface Facts
ON THE
CONTROL OF FLOWING WELLS

OTIS PRESSURE CONTROL SERVICE – EQUIPMENT

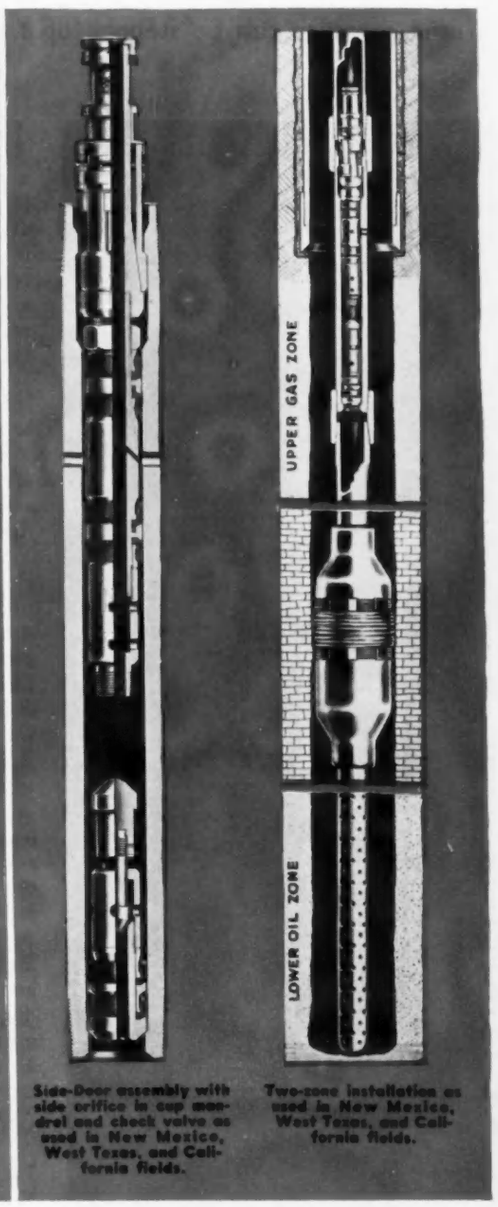
No. 3 1943 DALLAS, TEXAS

TWO-ZONE COMPLETIONS SIMPLIFIED .. Otis Type G Side-Door Choke Provides Means to Take Bottom Hole Pressure of Each Zone Independently of the Other without Moving the Tubing...



Side-Door Choke assembly as used for two-zone completions in South Texas and Louisiana fields.

Two-zone installation as used in South Texas and Louisiana fields.



Side-Door assembly with side orifice in cup mandrel and check valve as used in New Mexico, West Texas, and California fields.

Two-zone installation as used in New Mexico, West Texas, and California fields.

Proved practical by many hundreds of installations, the Otis Type G Choke furnishes a means for opening or closing circulating ports in the tubing string, a short distance above the packer, after the packer has been set and surface connections permanently installed.

This makes it possible to establish circulation and to completely unload both zones safely without moving the tubing or changing any of the surface connections. After the tubing and annular space are unloaded, the circulating ports are closed simply by setting the Side-Door Choke. This completely separates the two zones and permits them to be produced independently of each other.

The Type G Side-Door Choke consists of a locking device and a pack-off section. The locking device is simple, rugged, and locks only when in its landing nipple. The pack-off section consists of a cup mandrel on which are mounted four pressure-seal fabric cups. These cups are placed so that two will be above and two below the circulating ports when the choke is in set position. This arrangement completely blanks off all flow through the ports, regardless of whether the greater pressure is from the upper or lower zone.

SIDE-DOOR CHOKE A VERSATILE TOOL *Has Many Uses*

PROVIDES A MEANS TO:

1 Take Bottom Hole Pressures of either zone independently of the other without moving tubing. By equipping choke with cup mandrel which has open vertical bore and side ports, the upper zone is packed-off and pressures can be taken of lower zone only. Conversely, by using cup mandrel which has lower end of vertical bore plugged, but with side ports, the lower zone is packed-off and pressures can be taken of upper zone only.

2 Circulate or Swab-In Annulus after packer has been set and all connections permanently installed. Circulating ports in landing nipple are closed after both zones have been brought-in simply by running Side-Door Choke.

3 Kick off the Annulus should it become loaded up. The circulating ports in the landing nipple are opened simply by removing the Side-Door Choke, thereby permitting the annulus to be unloaded.

4 Utilize gas from an overlying gas zone to assist oil to flow from a lower zone. By equipping the choke with a small side orifice in the cup mandrel, a controlled volume of gas from the upper zone enters the tubing, reducing the weight of the oil column, and causing the lower zone to flow. A removable back pressure valve in the lower end of the choke landing nipple prevents the upper zone from charging the lower zone.

INSTALLED UNDER PRESSURE ON STEEL LINE

The Otis Type G Side-Door Choke is run or pulled under pressure on an ordinary steel measuring line without disturbing the tubing or well pressure. The pulling of these chokes, particularly where the two zones have a considerable differential in bottom hole pressures, has been greatly simplified by a special equalizing device constructed within the choke.

OTIS PRESSURE CONTROL, INC.

DALLAS, TEXAS

Branches: Houston and Corpus Christi, Texas; Hobbs, New Mexico; New Iberia, Louisiana; Magnolia, Arkansas.

Representatives: Otis Eastern Service, Inc., Wellsville, N. Y.; Western Pressure Control, Los Angeles and Bakersfield, Calif.

Export Office: 74 Trinity Place, New York City

Special Equipment Controls Shallow Depth Blowouts

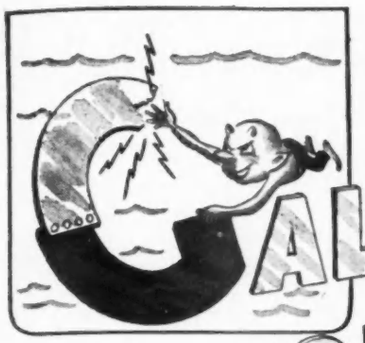
In West Texas drilling, high-pressure gas pockets in upper strata frequently clear the hole of mud with such violence as to wreck surface equipment. A quick-acting gate in the mud line and special vents permit control of this action until mud pressure can be stepped up to give required protection

DRILLING operations in West Texas are often plagued by a subterranean phenomena known locally as "air pockets." These so-called "air pockets" are in reality small volumes of non-combustible gases (mostly nitrogen) which are trapped under high pressure in cavities or porous zones of the salt strata. These cavities are penetrated at such shallow depths that the hydrostatic head of the drilling fluid cannot balance the pressure encountered—and a blowout occurs. The trapped gases invariably blow to exhaustion in from a few minutes to several hours and drilling is then resumed.

These blowouts generally do not occur with sufficient violence to be particularly dangerous to personnel or damaging to equipment, but there are plenty of exceptions to this statement. On occasion in any field, and almost invariably in certain fields, such pockets, when encountered, blow out with little warning and with almost explosive violence. Such instances present dangerous operating hazards to the drilling crews —and the likely possibility of damage to equipment, particularly mud-conditioning machinery. There is also an expense factor involved in that a goodly portion (at the very least a hole full) of drilling mud is invariably blown away and lost. Since West Texas formations produce no natural muds, all drilling fluids must be prepared from imported clays. Mud cost, therefore, constitutes an appreciable portion of drilling expense.

One drilling company, moving into a

The shortened mud line and slotted section of large pipe between the end of the line and the rotary type mud screen. This vents, to a great degree, the initial burst of pressure that accompanies a blowout and reduces the possibility of damage to mud-conditioning equipment. The spray of the vented mud also provides a good visual indication of an impending blowout.



GALVANIC CORROSION

OF DISSIMILAR METALS

And how milliampere Gremlins may be foiled at their own game

Today, dissimilar metals must frequently be used in more or less untried combinations. This is made necessary by metal shortages and urgent production needs.

Such combinations when exposed to liquids or moisture can result in serious galvanic corrosion. Therefore galvanic couples now merit much closer attention by plant and design engineers than was previously necessary.

Also, since its effects are not readily distinguished from those of the ordinary types of corrosion, it frequently is blamed for troubles it could never cause. Yet when really present, galvanic corrosion may be very serious.

Practices for controlling Galvanic Corrosion

1 Select combinations of metals as close together as possible in the Galvanic Series.

2 Avoid combinations where the area of the less noble material is relatively small. It is good practice to use the more noble metals for fastenings or other parts in equipment built largely of less corrosion resistant material.

3 Insulate dissimilar metals wherever practical. If complete insulation cannot be achieved, anything such as paint or plastic coatings at joints to increase the resistances of the circuit will help.

4 Keep dissimilar metals as far apart as possible. This rule applies even when the actual connection between the metals is made external to the corrosive liquid.

5 Apply coatings with caution. For example, when painting—do not paint the less noble material without also coating the more noble, otherwise greatly accelerated attack may be concentrated at imperfections in coatings on the less noble metal. *Keep such coatings in good repair.*

6 Prevent or limit aeration of the corrosive liquid as much as possible to sustain the polarizing effect of the hydrogen film which forms on bare cathodic surfaces.

7 If practical, add chemical inhibitors to the corrosion solution according to the nature of the solution to be inhibited.

8 Avoid joining materials well apart in the series by threaded connections, as the threads will probably deteriorate excessively. Brazed joints are preferred when practicable.

9 Whenever possible, install relatively small replaceable sections of the less noble material at joints and increase the thickness of the less noble material in such regions; for example, by using extra heavy wall nipples in piping or by attaching replaceable pads to critical surfaces.

10 Install pieces of bare zinc or steel to provide a counteracting galvanic protection effect to suppress galvanic corrosion.

•

INCO's Technical Service is prepared to assist metal users in solving galvanic corrosion problems. Available data from INCO's Corrosion Files for a particular combination of metals will be furnished wherever possible. Aid can also be extended in applying general principles to specific problems.

As a first step in securing INCO's help on a specific corrosion problem, write for a copy of the Corrosion Data Work Sheet.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York, N. Y.

GALVANIC CORROSION *and* THE GALVANIC SERIES

Galvanic Corrosion is caused by contact or connection of unlike metals in a corrosive liquid. Because generation of electric current is associated with galvanic corrosion, the metals act like a galvanic cell and corrosion action may become more serious and more rapid than that fostered by the corrosive liquid acting on the metals separately. Such action may be prevented or minimized by using the Galvanic Series to guide the selection of metal combinations.

GALVANIC SERIES

Corroded End (anodic, or least noble)

Magnesium
Magnesium alloys

Zinc

Aluminum 2S

Cadmium

Aluminum 17ST

Steel or Iron
Cast Iron

Chromium-iron (active)

Ni-Resist

18-8 Stainless (active)
18-8-3 Stainless (active)

Lead-tin solders
Lead
Tin

Nickel (active)
Inconel (active)

Brasses
Copper
Bronzes
Copper-nickel alloys
Monel

Silver solder

Nickel (passive)
Inconel (passive)

Chromium-iron (passive)
18-8 Stainless (passive)
18-8-3 Stainless (passive)

Silver

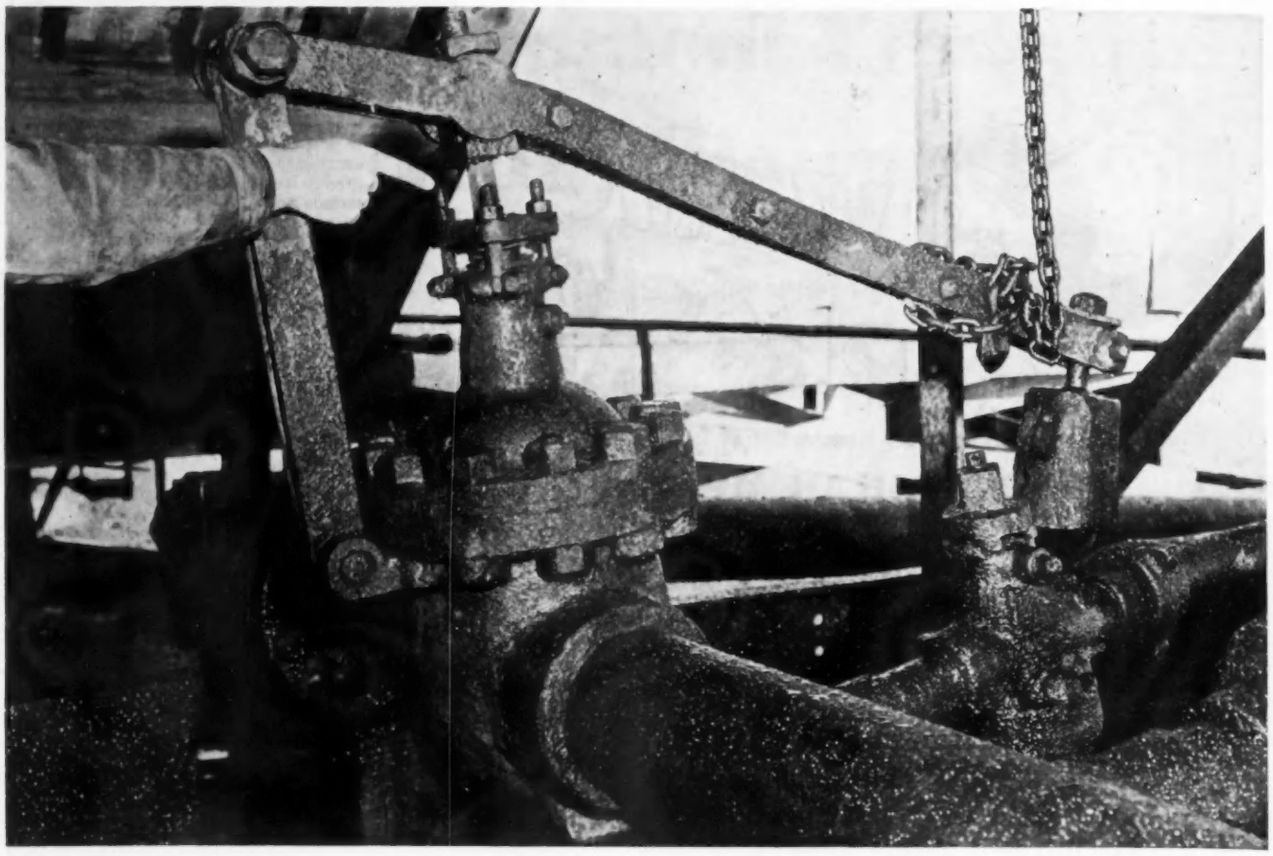
Graphite
Gold
Platinum

Protected End (cathodic, or most noble)

According to studies and practical experience from which the Series resulted, metals within a group have no strong tendency to produce galvanic corrosion of each other and therefore make relatively safe combinations unless the area of the less noble is markedly smaller.

The coupling of two metals from different groups and distant from each other in the list can result in galvanic, or accelerated corrosion of the less noble material. The farther apart the metals stand, the greater will be the galvanic tendency.

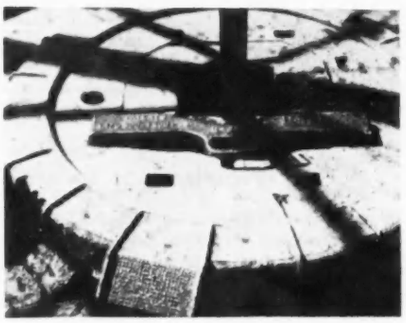
Although the arrangement of metals in the Series is based on results of experiments and practical experience involving many common corrosives, it cannot replace the need for tests when unusual corrosives are encountered or when other unusual conditions prevail that may cause major shifts of the relative positions of metals in the Series.



The quick-closing valve (above) installed at a convenient point in the flow line. The valve is held open by a chain passed up through the derrick floor.

Chain and slotted steel plate (left) which permit the valve to be locked open during normal drilling. A quick jerk on the chain releases the weighted handle and the valve closes.

While drilling through the danger zone the master bushings are locked in place to prevent their being blown from the rotary. Modern tables provide some means for locking these bushings. A common type is pictured at right.



territory already known to be dangerous on account of these high-level, high-pressure gas pockets, experimented with changes in method and equipment, seeking a means which would afford quick control of the pressure, once it was released against the mud column, yet which would not slow down or complicate normal making of hole. The steps taken to protect men and materials are four, involving minor changes to mud-line and rotary hook-up.

The mud line was shortened and a section of pipe larger than normal mud outflow line inserted just ahead of the screen. This enlarged section, in addition to providing space for expansion of gas carried in the mud stream, was also opened at the top with a wide cut-away section or slot. A gas-laden charge of mud, reaching this point, would seem to explode, most of the gas and a little mud being blown vertically through the slot, saving the screening equipment just beyond from the force of the blast.

A quick-closing valve was installed in the mud flow line, at a convenient point below the derrick floor, the weighted arm of the unit being normally held up by means of a chain supported in a quick-release fastening set into the derrick floor. Since positive, quick closing was of more importance than positive seal against all flow, the packing on the stem of this valve was left loose enough to insure that binding at this point would not defeat the snap action of the weight in closing it.

While drilling through the danger zone the master bushings in the rotary are locked in place to prevent their being literally blown from their socket by the force of the blow up along the drill string. Since modern rotary tables provide some means of securing the bushings within the table, this step merely involves provision of proper locking bar and its use through the danger zone.

When the blowout zone is approached a close watch is kept on the flow line vent and, if a blowout is indicated, the locking chain is released and the quick-acting valve is closed. This eliminates any possibility of damage to the mud-conditioning machinery and confines the blowout to the cellar area. The drilling fluid is, of course, blown straight up against the locked master bushings—and falls back into the cellar to be recovered.

The equipment and application technique worked out effectively reduce the hazards of these blowouts when they do occur and permit the recovery of most of the mud previously wasted on penetration of a highly charged gas pocket.

Systematic Measures Would Increase Production of Old Shallow Wells

Surprising increase might be effected at small cost and without use of much critical materials if widespread program is adopted

By JACOB SCHMER

THE ever-increasing need for oil products for a victorious persecution of this global war and the logical prospects of a world-wide oil hunger in the post-war years, gives the problem of increasing crude-oil production high actuality.

This increase can be effected now with small cost, in a short time, and without much use of new and essential materials, tools, and machinery which are difficult, if not impossible, to obtain. Uncle Sam needs your increased production now, but he cannot let you buy freely, as in pre-war times, all the machinery, casing, and materials for drilling new wells, without crippling the production of urgently needed war weapons.

To solve this problem is the patriotic duty and honorable obligation of the American oil industry and a test of the ingenuity of every producer, large or small. If every producer will give the deserved care and consideration, and try practically to solve this problem in his own company, the final total result will be without doubt a surprising success.

Just as we changed our actions and thinking in regard to scrap, rubber, food, and gasoline rationing under the impact and necessities of war, we must change our "proration mentality" and our pre-war policy of curbing crude-oil production, bearing in mind that every additional barrel of oil shortens the war and hastens victory.

To obtain this goal in shallow wells, to which this article is dedicated, and in which I have a special and long, practical experience, I suggest the following measures:

1. Increase or restore the gas pressure in all wells through injecting compressed gas or air in a few carefully selected input wells.

2. Clean, systematically, well after well, starting with the oldest and lowest producing wells in the following way:

A. Extract tubes and pump, clean them and test them carefully. Pay special attention to pump, adjust, repair, and change the pump if necessary.

B. Extract with clean-out tool everything from the well until you reach the bottom of the well. You will be surprised, sometimes, at how much paraffin, mud, sand, and (very often) water, you will extract before you have a clean bottom.

C. When cleaning out, scratch a few inches from the bottom and from the oil-producing sandstone, if this is technically possible. This removes the oxidation from oil-stone and opens the oil veins.

D. Heat the oil-producing formations in the well after cleaning for a minimum of 24 hours with hot, light oil or steam or with an electric heater. Pump a quantity of hot oil or steam in the well sufficient to bring the level to twice the height of the normal oil level in the well. Then put in your previously cleaned pump and proceed as usual. Pump regularly, measuring carefully the production which, if possible, keep in a separate reservoir, for a minimum of one month which will give you a clear picture of the results, and if successful will give you the incentive to speed up with the same or similar methods in other wells.

3. If the results, after applying all the above measures, are not satisfactory, shoot the oil sandstone, but only if this formation is "free" (below the casing) or if the casing can be moved higher without much difficulty and without danger of opening the water. The results are often sensational and well worth trying. Some wells have increased their production 5000 percent with these methods.

4. In the event that shooting was not successful or was not possible to apply for technical reasons, deepen the well after consulting an experienced geologist who is familiar with this terrain. If you have a portable rig and the necessary tools, this is not difficult nor expensive to do and is often very successful. Sometimes you discover, after deepening only 25 to 100 feet, a new oil-producing sandstone. The oil-producing formation in shallow wells resembles usually, a thick layer cake with many layers. Very often, if the initial production of a well is satisfactory, drilling is stopped on the first or second layer of sandstone although there are many more higher-producing layers in the horizon which are usually separated by shales or limestone. In a larger oil field with many shallow wells, it is more economical and advisable to take first one or more wells with a negligible production in different locations as "guinea pigs" for this deepening experiment and according to the results, you can later apply the same procedure to all other wells, quickly, cheaply, and with no new experimentations and fears.

5. If you have made all the above experiments and you are still not able to increase production in some wells and the production is negligible and uneconomical, salvage the casing and liquidate such wells, using the casing for the drilling of new wells.

The experienced oil man knows that every oil field and, very often, every well, has its own individualities, and sometimes caprices, and that there can be no general prescription for every well or oil field. It is your task to adopt these suggestions in the most suitable way to your well or oil field.

I do not claim that my suggestions are especially new to most oil men experienced with shallow wells but I hope they will offer an incentive to a methodical experimentation in this direction for many oil men and companies who have not used these methods. I am confident that the general results will be positive, successful, and often sensational, and we can in this way efficiently increase production.

PRACTICAL OPERATING *Hints* FOR THE DRILLING RIG

$5.00 will be paid for each illustrated acceptable contribution. Mail to The Editor, THE OIL WEEKLY, *Houston.*

1. SUCTION LINES

Counterweighted Line Speeds Strainer Set

Weight on free end instead of knot permits dropping mud level without the use of tongs.

TYING the line which supports the outer end of the mud-pump suction line to the usual joint of drill pipe means that the line must be untied or the pipe rotated rapidly if adjustment is necessary to keep the suction submerged in event of a sudden change in mud pit level.

By hanging a weight on the dead end of the line, after taking some six or more wraps around the pipe to prevent slipping when the improvised windlass is turned with the wrench to lift the pipe, the line is held taut without need for a knot.

When thus supported, the suction can be dropped simply by lifting the weight a few inches, working the slack around the pipe with (gloved) hands, and allowing the foot-valve to be lowered by the amount of the slack put into the line. No change or working with the usual wrench or chain tongs used for lifting the suction is required for lowering the unit if the binder weight is used.

2. RIGGING UP

Hose Insert in Mud Line Cuts Vibration

BY INSERTING a section of mud hose between the pumps and the stand-pipe flexibility is obtained to compensate for minor variations in the relative positions of pump and pipe, and thus eliminates the need for calling out a welder on each job to refit the mud line. This hose section also acts to absorb or dampen vibration, and to afford protection to joints and fittings without the use of an air chamber.

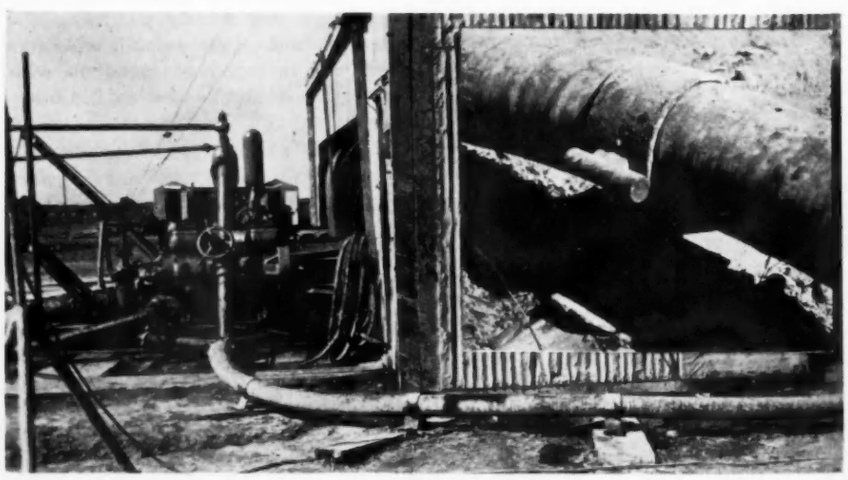
Due to the need for conserving rubber, ingenious protectors were worked out to prevent chafing of the hose on the ground. Clamp members, with a broad shoe for ground contact, were designed, a single bolt closing the support to prevent turning or shifting within the two sections of the hose clamp. By close spacing of these supports, or "hose walkers," as they are known on the job, it is possible to free the entire length of hose from abrasion or damaging contact with the ground or rig obstructions.

3. STEAM HEADERS

Ground-Level Valves Provide Quick Cutoff

WHILE the standard master steam valve of a boiler must be placed as close as possible to the outlet from the shell, such a location is unhandy, and requires additional time to open or close in case of emergency, also adding to safety of fireman in case of steam line break.

One drilling company uses two valves in the steam line ahead of the manifold for each boiler, the first being the code valve, the second a rising-stem unit set at convenient operating height from the ground on a short nipple above the header. These valves, their indicating stems showing at a glance whether open or closed, may be manipulated in comfort, safety, and away from any live steam which might be leaking around



Section of mud hose between pumps and stand-pipe speeds set-up. Chafing shoes (upper right) clamp on hose and prevent damage to carcass by eliminating contact with ground.

IT'S UP TO YOU AND ME

Win this war and we keep our way of life—our freedom of worship, our freedom of speech, our free enterprise that has given us more luxuries and more leisure than people of any other nation have ever enjoyed.

Lose this war and we become another Norway, which wanted peace too well. Her children are suffering from hunger and cold for the Nazis stole their food, clothing and fuel. Or we become another Greece where children and everyone are slowly starving to death while Nazis eat hoggishly of stolen food.

Let's make sure to preserve the greatest gift a human being can have—liberty. Let's buy *War Savings Bonds* to the very limit of our ability and thus hasten victory and at the same time build up an immense reservoir of money for after-the-war purchasing which will sustain continued prosperity and employment.

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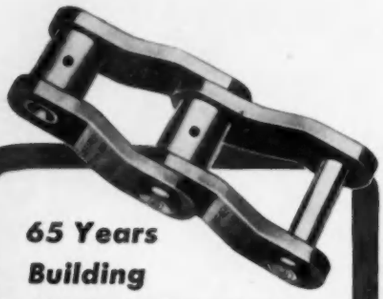
MISSION ROTARY SLIPS MISSION SWABS MISSION PLUG VALVES



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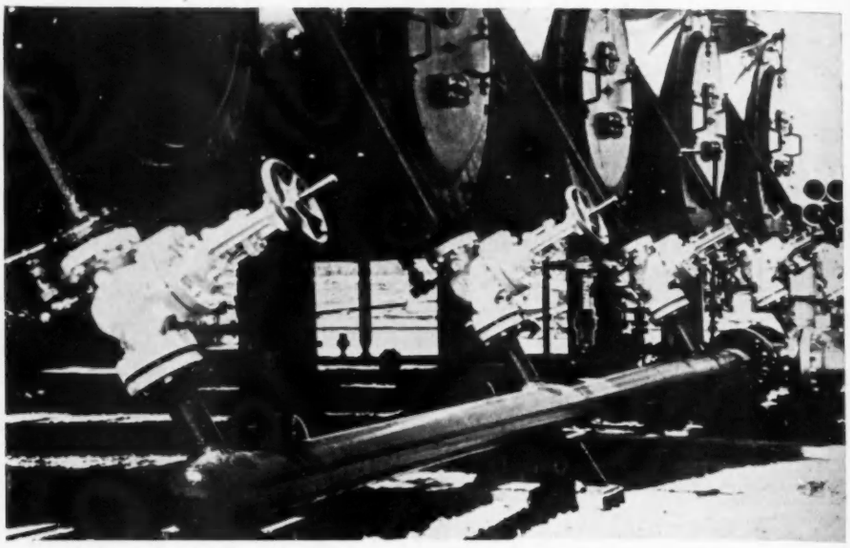
the tie-in to any boiler unit.

Under normal operating routine, the lower gates are used for blanking off a boiler for wash-down, overhaul or temporary withdrawal from service, the overhead units being operated only frequently enough to assure proper functioning and in case of damage to the lower valve or leakage in the connecting line between the two units.



A second set of steam control valves permits regulation without need for climbing to top of battery and provides double stop in case of failure of either unit in the line.

4. SUBSTRUCTURES

Split Beams Reduce Steel Beam Demands

SHORTAGE of structural steel places added premium on any method which will reduce the amount required for drilling-rig set-up. The plan worked out by one contractor almost halves the weight of rolled shapes required, and thus contributes to the war demand by making steel go farther.

The plan involves the splitting of each beam through the center of the web, forming two T-beams with flanges of the original stock, and new webs equal to half that of the H or I-beam split. The wide bearing surface of the flanges is utilized as effectively as with the entire beam, the bent or supporting member being made up by welding pipe or drill-stem standards to give the desired spacing. To compensate for the loss of stiffness incurred by reducing the beam, wide-angle braces are included at each spacer or post, these braces being made of scrap steel plate no longer suitable for tank use.

Use of the split beam increases the headroom between members as compared with that available with full beam construction, and the completed bents, notwithstanding the wide-angle braces, are much lighter than when the unit included twice the weight of flanges as with the earlier design.

The open web is actually easier to weld to than the former I-beam.

One beam, divided longitudinally, forms both top and bottom of this substructure frame.

4 SIMPLE RULES OF PUMP CONSERVATION

1. KEEP PUMPS CLEAN

2. CHANGE CRANKCASE LUBRICANT AT LEAST TWICE A YEAR

3. ADJUST BEARINGS AT FIRST SIGN OF LOOSENESS

4. DO NOT OVERLOAD THE PUMP

We have portrayed the rules of pump conservation humorously, but they have a mighty serious meaning in these war days.

Upon the care that you give your pumps depends your ability to get out of them ALL of the dependable service that we have built into them. This is important not only from your own standpoint, but from the standpoint of the nation. For pumps represent metals, manpower and transportation which we can't afford to waste.

May we suggest that patriotism and self-interest both call for the establishment of a special war-time program of pump conservation, based on the rigid fulfillment of the rules above outlined? ... Gaso Pump & Burner Mfg. Co., 902 E. First Street, Tulsa, Oklahoma. Export Office: 149 Broadway, New York. Los Angeles: Service Oil Field Supply Co., 5333 S. Riverside Drive.

GASO PUMPS

FOR EVERY OIL INDUSTRY NEED

Frequency of Dry Holes Rises Sharply in Kansas Completions

Cause not entirely due to growth in number of wildcats being completed, for larger percentage of pool completions failing

By JOSEPH A. KORNFELD

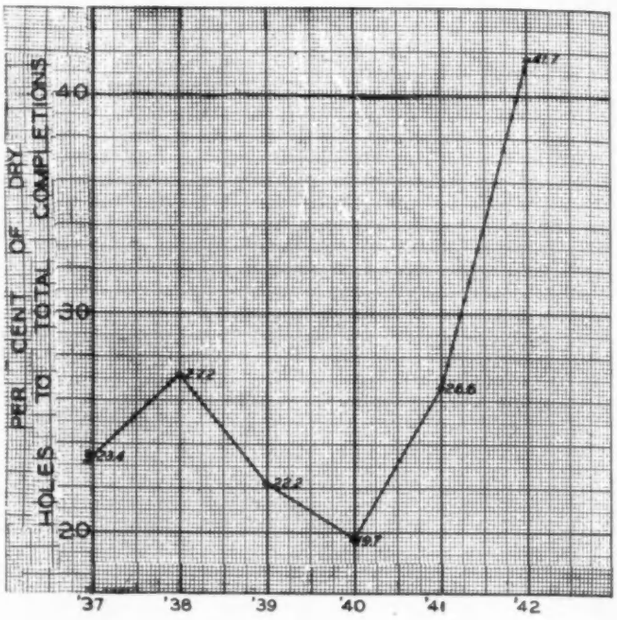
THE rising frequency of dry holes evident throughout most of the United States is well exemplified in Kansas oil development. An analysis of statistics on recent drilling results shows that the percentage of dry holes to total well completions in the state during 1942 rose 15.1 percent over the 1941 level to a new record high ratio of 41.7 percent. This is based on statistics released by the conservation division of the Kansas Corporation Commission.

A parallel rise in the percentage of dry holes among wildcat wells is reflected by an analysis of data compiled by a private source, which revealed that 4.6 percent more of the exploratory type tests were failures in 1942 than in 1941. The ratio of dry holes to total wildcats completed in 1942 stood at 90 percent last year as compared with 85.4 the preceding 12 months. These data are significant in that few if any of the 34 discovery oil wells completed during 1942 were situated more than 10 miles from the nearest developed proven area.

With wildcats accounting for a larger percentage of the completions in the state (23.6 percent in 1942 against 12.6 percent of all wells completed in 1941), it is natural for the proportion of dry holes to increase. However, this only partially accounts for the growing frequency of dry holes in the state. For similarly, there has been an increase in the percentage of dry holes in total completions in proven areas. When the number of wildcat tests listed by a private source are deducted from the commission's total completions to determine the number of wells drilled in proved territory, it is found that 7.27 percent more of these wells were dry during 1942 than in 1941. The 1942 ratio stood at 26.7 percent dry as compared to a 18.1 ratio percentage recorded in 1941.

Conversely, as to be expected, the percentage of oil wells to total well completions in the proven areas of Kansas dropped. The actual 1942 ratio of producing completions among so-called pool wells was 66.7 percent, in contrast with 78.0 percent in 1941. Similarly, the percentage of oil wells to total well completions in both proven areas and wildcat districts combined fell. Only 53.1 percent of all completions in 1942 produced, whereas in the preceding year 69.8 percent had been productive.

Apparently, the factors underlying the rapid change in drilling in proved areas may be ascribed to the drilling of marginal wells in developed fields and the hazards of development in areas of Western Kansas surrounding the Central Kansas Uplift, where buried Arbuckle dolomite (Ordovician) topography is featured by many solution cavities or sink-holes. The effect is accelerated by the lack of few recent discoveries covering large horizontal extent which would permit considerable offset work, and the drilling on 40-acre spacing which causes quick over-stepping of producing boundaries.



Trend of Kansas Completion Results for Past Six Years

YEAR	WELL COMPLETIONS				PERCENT OF COMPLETIONS		
	Oil	Gas	Dry	Total	Oil	Gas	Dry
1937	1,894	113	613	2,620	72.3	4.3	23.4
1938	1,011	63	402	1,476	68.5	4.3	27.2
1939	980	55	295	1,330	73.7	4.1	22.2
1940	1,461	54	372	1,887	77.4	2.9	19.7
1941	1,541	79	589	2,209	69.8	3.6	26.6
1942	832	82	653	1,567	53.1	5.2	41.7

Source: Kansas Corporation Commission, Conservation Division, Wichita.

Comparison of Kansas Dry Hole Trend in Wildcat and Pool Wells

	WELL COMPLETIONS				PERCENT OF COMPLETIONS		
	Oil	Gas	Dry	Total	Oil	Gas	Dry
Wildcat Wells:							
1941	37	4	239	280	13.2	1.4	85.4
1942	34	3	333	370	9.2	0.8	90.0
Pool Wells:							
1941	1,504	75	350	1,929	78.0	3.9	18.1
1942	798	79	320	1,197	66.7	6.6	26.7

☆ ☆ ☆ ☆ WASHINGTON ROUNDUP ☆ ☆ ☆ ☆

Ickes Made Strong Plea for 35 Cent Crude Price Boost

House Committee Urges Approval of Higher Crude Prices

PAW California Office Authorized to Administer PAO 11

By B. F. LINZ
Washington Correspondent

☆ ☆ ☆ ☆

IMMEDIATE approval of Administrator Ickes' recommendation for an average 35-cent increase in crude prices, greater efforts to provide the raw materials necessary for production, protection of the industry's manpower and readier acceptance by other agencies of PAW recommendations were urged by Representative Wright Patman, chairman of the House little business committee, April 20, in a letter to Speaker Sam Rayburn previewing the report which the committee shortly will make on its recent oil hearings.

Another development of importance was the finding out for certain that Administrator Ickes had made a strong plea for a 35-cent per barrel increase in crude oil prices to OPA. The text of Ickes' price letter, which was made public during the week, revealed that the PAW head did not expect to assume any responsibility for any shortage of oil if OPA refused his price recommendation, and warned that if moderate advances were not allowed now that the petroleum situation was likely to deteriorate to the point that drastically higher prices would be found necessary later.

Meanwhile, the attitude of Sumner T. Pike, OPA's fuel division director, was revealed in a memorandum on Ickes price letter. It developed that Pike is of the opinion any crude price increases should be on an individual area basis rather than a general over-all procedure. He dismissed arguments that higher prices would help stripper wells and secondary recovery programs, by stating they acounted for too small a quantity of oil. While viewing the reserve situation as critical, Pike stated that it was natural for the most recent year to appear most disappointing from a discovery standpoint because sufficient development had not taken place to permit accurate estimates of the volume found.

Patman reviewed the testimony received at the hearing, which he said showed that "the problem of obtaining additional production or even of maintaining present levels of production is pre-eminently a matter of price."

"We recommend that the over-all ceilings on crude petroleum prices be lifted to a level which will encourage ample production and prevent monopoly," he said, adding that Ickes' recommendation should be made effective "without further delay" and a continuous scrutiny of prices should be maintained to enable "such prompt adjustments as may be or become necessary to insure an adequate supply of crude petroleum to meet war and essential civilian requirements."

"Clearly," the report continued, "there has not been sufficient consideration given to the requirements of the petroleum industry for materials with which to operate. Oil is ammunition. Every possible effort should now be made without delay to supply materials required for the production of petroleum.

"The manpower supply in the petroleum producing industry has been greatly depleted because of the inability of the industry to increase its price sufficiently to enable it to compete in the labor market with industries whose position has not been so severely restricted by price. This problem should have close attention to the end that the labor ranks of the industry may be maintained sufficiently to continue essential exploratory and developmental work and production.

"The president has established PAW charged with the primary responsibility for petroleum supply," Patman concluded. "The recommendations of that office should carry great weight with other agencies of government concerned with these recommendations."

Ickes told OPA that the rate of new discoveries and the ultimate available production from presently known reserves "are in no small degree a function of price . . . unless new fields are found more rapidly, secondary recovery stimulated, and somewhat higher-cost production prolonged, we face first a loss of recoverable reserves arising from a wasteful forcing of such flush fields as we still possess, and shortly thereafter an actual scarcity of sufficient amounts of even reasonably low-cost crude oils."

While agreeing that price inflation was a dangerous spiral, Ickes warned that a deflationary effect upon "our ultimately recoverable reserves and our daily capacity to produce, can likewise spiral and be difficult to arrest." Considerable importance was attached to Ickes' statement that the President has asked him to express his judgment with respect to the oil situation.

A grant of autonomy was given the District 5 PAW office in the administration of PAO 11, which may presage a greater degree of independence from Washington for all PAW field agencies. The West Coast's self regulation of PAO 11 was coupled with the issuing of specific regulations for operations in California fields, under which automatic approval is granted drilling, reconditioning, plugging back and pumping operations when certain conditions are met. This is expected to reduce paper work and speed up delivery of equipment.

Ickes Warns of Drastically Higher Prices Later If Moderate Increase Not Given Now

Text of Administrator Harold L. Ickes' letter to Price Administrator Prentiss M. Brown, recommending an increase averaging 35 cents a barrel in the price of crude oil and serving notice that the PAW head would not assume the responsibility for any shortage of oil which might result from failure to adjust prices, was made public by Representative Wright Patman of Texas, chairman of the special little-business committee of the House, April 19.

The letter was made available to the committee by OPA after a hearing April 16 at which Brown and Sumner Pike, director of the oil-price section, attempted to evade questions both as to its receipt and contents and in the course of which Pike, while emphasizing that his mind was open on the subject, expressed the opinion that present prices are a sufficient incentive to exploration.

"After months of study, I have reached the conclusion that I must now recommend that a general upward adjustment of crude-oil-price ceilings averaging approximately 35 cents per barrel, with necessary equivalent and concurrent adjustments in petroleum-product prices, is required to attain those objectives relating to the supply of petroleum and the efficient wartime operation of the petroleum industry, concerning which the President has asked that I express my judgment," Ickes wrote.

"Exploration for and production of crude oil involve enormous risks. Evaluations of these risks cannot be reduced to exact mathematical formulas. They are peculiarly a subject for informed judgment. But the absence of an exact mathematical relationship between crude-oil supply and crude-oil prices must not be allowed to hide the fact that the rate of new discoveries and the ultimate available production from presently known reserves are in no small degree a function of price. Our studies convince us that in a matter of months, unless new fields are found more rapidly, secondary recovery stimulated, and somewhat higher-cost production prolonged, we face first a loss of recoverable reserves arising from a wasteful

forcing of such flush fields as we still possess, and shortly thereafter an actual scarcity of sufficient amounts of even reasonably low-cost crude oils."

Dangers of Inflation

Agreeing as to the dangers of price inflation, Ickes pointed out that price inflation connotes an unwarranted rise in prices without promise of increasing supply, and expressed the fear that "unless we are prepared now to permit some increases in oil prices in order to stimulate increases in our available supplies, our reserves will continue to be depleted at such a pace that only a drastic increase in prices—perhaps several dollars a barrel, as contrasted with a tenth of that amount if we act now—will be required to find and produce the oil we are certain to need both during the war and after."

An inflationary price spiral, once started, is difficult to arrest, he said, but a deflationary effect upon our ultimately recoverable reserves, and our daily capacity to produce, can likewise spiral and be difficult to arrest.

Ickes explained that the proposed increase would amount to less than one cent a gallon on products, and expressed the belief that so far as consumers are concerned he was sure they would prefer moderate prices and adequate supplies for the long pull rather than to be compelled to pay for artificially low prices now with "ridiculously" high prices and scarcity a very little later.

And, he warned Brown, "measured in terms of our oil supply— the task entrusted to me—I am not prepared to assume the responsibility of risking a repetition of what occurred at the close of the last war, when after crude-oil prices had been rigidly frozen and our reserves depleted, crude-oil prices rose to $3.50 and even $4.30 per barrel and untaxed gasoline to 25 or 30 cents per gallon. Moreover," he asserted, "had that war lasted but a little longer, the oil shortage might then have made it difficult to supply the armed forces with enough oil. The possibility of such a difficulty in this war, if it be long protracted, is a risk that should be carefully considered."

Reserves

Briefly outlining the reserve situation, and pointing out that while there is a vast amount of oil in the ground it cannot be produced in toto in less than half a century, Ickes continued:

"You may ask how much of a price increase is required to rectify these conditions. I do not know exactly and I am quite certain no one else knows. If anyone knew with mathematical exactitude, finding and producing oil would not involve such enormous risks. But this I do know—an increase in prices makes it economically possible to increase recoverable reserves (1) by postponing the date of abandonment of thousands of pumping wells, (2) by the installation of more and better secondary-recovery equipment, (3) by drilling edge properties and so-called marginal locations, and (4) by attracting venture capital from both within and without the petroleum industry to undertake that greatest risk of all, exploring for new fields. Of course, material, labor, and other costs have risen in the producing branch of the oil industry. With the introduction of overtime, necessitated by the 48-hour week, labor costs will rise still further. Such factors as these can be more or less exactly measured. But none of these items of added cost, however much they can and do justify some increase in crude-oil prices, is as important as the hard, cold facts of declining rates of discovery and increasing demands.

"My present recommendation of an increase in the price ceiling for crude oil may be too little, but strictly from an oil standpoint, I am confident that it is not too much. Fortunately, the government can test it pragmatically, just as the industry always has in times past. If in the months to come the action now recommended reverses the decline in reserves or the rate of new discoveries, we shall know that it is effective. If not, the subject should be re-examined. To the extent that some may derive a small windfall from such an increase, I prefer to leave that to be largely recaptured by existing taxation rather than have the government itself enter this most speculative of businesses, or by indirection, reach the same result by undertaking the colossal task of administering some subsidy arrangement."

The administrator recommended that in the specific application of general upward adjustments in crude prices, due allowance be made for radical changes in the sources and methods of transporting crude which have occurred, and cautioned that unless "necessary equivalent and concurrent adjustments" be made in product prices, the small non-integrated, independent refiners will be squeezed between the two millstones of rising raw-material costs and fixed refined-products prices. In that adjustment, he said, a "very substantial" part of the increase should be placed upon fuel oils.

OPA Fuel Director Thinks Ickes Taken For "Statistical Ride" on Reserves

A memorandum on Ickes' letter recommending a 35-cent per barrel increase in crude prices (see page 41) prepared by OPA's fuel division director, Sumner T. Pike, reveals that he thinks the way to deal with the question was by action in individual situations, such as the recent adjustment in California heavy crude prices rather than a general increase, and that he felt the reserve figures of PAW were not based on sound development statistics.

Raising of California heavy crude prices have "put the crude structure reasonably well in balance, with the exception of an area in Texas south of Corpus Christi, where it may be that some adjustment in the next several months will prove to be both desirable and necessary," commented Pike.

Ickes' contentions that an increase would postpone the abandonment of stripper wells, encourage secondary recovery and the drilling of edge and marginal properties were dismissed by Pike with the comment that in the case of stripper wells, the price of all oil in the country should not be increased to afford relief to less than 10 percent of the production, that the same applied to drilling of edge and marginal properties and that secondary recovery accounts for substantially less than five percent of the total production, over half of which is in the Pennsylvania area where high prices prevail.

The administrator's argument that venture capital would be attracted was admitted by Pike to have some merit, but he said it is not now necessary to stimulate exploration, since last year about as many wildcat wells were drilled as in the peak year and as many fields found as in any previous year.

Dislikes Reserves Figures

Pike admitted that the number of barrels discovered in new fields looks disappointing, but took the position that a large field almost never is thoroughly explored for several years and commented that "somebody has evidently taken the secretary (Ickes) for a statistical ride in presenting the figures." Pike evidently was referring to PAW's policy of charging back to the discovery year all additional reserves considered added by further development of a pool, for he added "The most recent year almost always looks like the poorest year because no one knows the magnitude of what was found so recently."

"One more remark," he added, "the secretary states that the reserve situation is serious. I think that it is serious too. We differ, however, on the question of how serious it is. Discoveries are continuing this year at a fair rate but the main point is that there are two areas in Texas where by additional transportation alone we could add some 350,000 to 450,000 barrels per day to our effective production without overstepping the bounds of conservation."

ODT Opens Another Tank Car Office at Chicago

Further decentralization of the division of petroleum and other liquid transport through the organization of a fourth field office by the section of tank car service at Chicago was announced by ODT April 19.

Arthur E. Carlson, who for nearly a year has been in the Washington office of the section, will temporarily head the field agency.

The section of tank-car service is responsible for providing tank cars for all essential movements of liquid products, issuing permits for all shipments of 200 miles or less, studying the efficiency with which tank cars are used and diverting cars from services in which surpluses exist. Eventually the Chicago office will handle all permits for movements in Illinois, Indiana, Michigan, Minnesota, Wisconsin, Iowa and Missouri. Approximately 25 percent of all ODT permits for short-haul movements, issued under the program for the diversion of short-haul shipments to tank trucks, cover shipments in that region, it was said.

New PAW California Rules Give Automatic Approval When Specified Conditions Met

Set-up for independent action by the West Coast PAW office in administration of PAO 11 was outlined by PAW April 21 simultaneously with issuance of amended Supplementary Order No. 4, which outlines the standards and conditions for development and production operations in substantially all California fields. The order provides for automatic authorization where wells meet specified conditions.

Under the authorization, Herbert R. Gallagher, district director, will be granted powers, which he may re-delegate to Lawrence Vander Leck, production director, with respect to production operations, and Kenyon L. Reynolds, director of natural gas and natural gasoline, with respect to natural gas, natural gasoline or condensate operations, to:

Grant exceptions for the drilling of new wells in certain pools, permitting a reduction in the size of the drilling unit down to the number of acres specified in a schedule prepared in Washington;

Grant exceptions with respect to certain pools, permitting a reduction of 10 percent in the drilling unit acres or well density prescribed, or a reduction of 20 percent in the required distances between well locations. This authority being limited to cases where extraordinary and unusual topographic conditions exist;

Grant exceptions, under certain limiting conditions, with respect to a new well in a "town lot" field;

Grant exceptions, under certain limiting conditions, with respect to operations involving the recompletion of a well by perforating, plugging-back, deepening or re-drilling of an existing well in any formation other than that in which the well was last completed;

Require operators to file with the district office, prior to the commencement of a production operation in California, a copy of such official form as is required to be filed under the state law in connection with such operation; and Deny any application for exception, subject to the right of the operator to appeal to PAW in Washington.

Announcing the plan, Deputy Administrator Davies explained it is an example of a general process of decentralizing PAW operations and the devising of more definite standards for wartime development and operation of oil fields, these standards being devised to fit West Coast conditions. Davies said they should accomplish the result of securing the maximum number of barrels of oil with the minimum use of steel and other scarce materials. It is fitting that, with the promulgation of these standards and the accompanying elimination of paper work, that such of the administration of the orders as can be more expeditiously handled in the field should be delegated to PAW's district office, where practical application is assured by the caliber of the experienced oil men to whom this has been entrusted.

"The amended supplementary order sets up standards under which it was said, probably 90 percent of the new wells drilled in California will automatically be eligible for priorities assistance without any formalities, and which take into consideration the existence of several oil strata, the thicker sands and the wide variation in gravity, making allowance therefore in the spacing requirements.

PAW officials summarized the major points of the order as follows:

Designates specifically the great majority of California fields and defines the separate pools in the fields by accepted electric well log points, well defined geological formations, accepted geological contact points or depth limits in terms of feet.

Establishes a standard of 5, 10, 20 or 40 acres spacing patterns for new wells in each pool, and wells conforming to these standards will require no further authorization or exception and will automatically be eligible for materials and priorities assistance.

Establishes standards for reworking or rehabilitations old wells in each pool, and wells conforming to these standards will require no additional authorization or exception and will automatically be eligible for materials and priorities assistance.

Establishes standards for installation of pumping or other artificial lifting equipment, and wells conforming to the standards will require no additional authorization of exception and will automatically be eligible for materials and priorities assistance.

Permits directional drilling without application for exceptions and provides that the surface location of such well will be considered to be a vertical projection from the bottom of the hole.

Exceptions will be required to drill in certain pools where a gas cap exists, permitting plans to be worked out to apply sound oil field engineering practices in each such pool, so that the gas cap energy can be utilized with maximum efficiency.

New Free-For-All Synthetic Rubber Row Adds No Light on Question

Rubber Director William M. Jeffers and War Information Director Elmer Davis tangled last week over the question of tires for civilians, and after the dust settled the public knew no more about the real rubber situation than it had before.

Toward the end of the week the controversy spread to bring in PAW and the War Department, leading to suggestions that the Baruch committee be revived to make a new survey of the whole situation.

Cause of the controversy was a lengthy report issued by OWI in which it was stated civilians would get no new synthetic tires for another 15 months and that they would not be available in any quantity until after September, 1944.

Until then, it was declared, car owners would have to get along with tires manufactured prior to Pearl Harbor, a small supply of war tires and about 5,000,000 casings collected through the idle tire purchase plan, most of which require repairs or recapping. There is plenty of camel-back for recapping, but recaps are good only if speeds are kept down under 35 miles an hour.

OWI saw only 716,000 tons of rubber available through 1943 with requirements of 612,290 tons, leaving a balance of only 104,000 tons on hand at the close of the year. "This is obviously too low a balance, since the experts all agree that the rubber-manufacturing plants must maintain an inventory of at least 100,000 tons or face closing down," it was stated.

Jeffers' criticism of the report was that it was based on old and obsolete data, that it had been "kicking around" OWI for weeks in which the picture had changed radically.

Meanwhile, the War Produciton Board halted construction of five alcohol producing plants on the ground that more than enough alcohol was being produced to meet the program, and an official of the WPB chemicals division told a Senate committee that if operations continued at the present pace it may be possible to lift some of the restrictions on tires.

The Jeffers-Davis fight will be reviewed in the near future by the Senate Agriculture Committee, which will call both officials before it, and may also come up before the Senate Judiciary Committee, which has initiated an investigation of OWI operations.

Army and Navy officials for some time have complained that the rubber program was interfering with the production of high-octane gasoline and ships, creating a bottleneck in valves. This complaint was voiced in the Truman committee report on ship construction, and Undersecretary of War Robert P. Patterson put the Army view into words when he declared the air campaign in Europe will be gravely weakened unless prompt steps are taken to bolster the aviation-gasoline supply. Previously Ickes had asserted that the granting of Jeffers' program had cost more than 7,000,000 barrels of high-octane.

Patterson declared that because of the fuel shortage, military aircraft have had to be grounded. He concurred in Ickes' statement that there were not enough materials for both rubber and gasoline and that a larger share should be devoted to production of the latter.

Jeffers immediately countered with a demand for an immediate investigation of Patterson's charge, which he said "is so serious and so directly affects the war effort and the American people and

might contribute so materially to the comfort of the enemy that it calls for an investigation to bring out the true facts."

The suggestion was accepted by Senator Guy Gillette of Iowa April 23, and it was announced that his agricultural subcommittee which has been engaged in oil-rubber investigations, would inquire into the dispute at once.

WPB Director Donald M. Nelson also promised "instant action" if someone can "tell us where this equipment is and exactly how the 100-octane program can be stepped up."

Gillette declared the situation should be settled without delay, asserting that the contention over the different programs is seriously hampering the war effort.

OPC to Finance Products Line Extension

Defense plant corporation will finance the extension of the 20-inch products line from Seymour, Indiana, to New York, it was announced April 20 by Secretary of Commerce Jesse H. Jones.

DPC approved the financing of the 16-inch line from Baytown and Port Arthur to Beaumont, Texas, and the 20-inch conduit from that point to Norris City and Seymour two months ago, earmarking $44,000,000. The extension to the East will cost about $31,000,000.

Jones also reported that the Plantation eight-inch extension from Greensboro, North Carolina, to Richmond, Virginia, has begun to move oil at the rate of 30,000 barrels daily. Construction of the line was begun last November 24, with the use almost exclusively of reconditioned pipe and second-hand motors. Cost of the extension was approximately $4,350,000.

All told, Jones said, DPC has authorized a total expenditure of approximately $186,000,000 on seven pipe line projects.

Big Line Makes Norris City Biggest Railway Oil Center

Approximately 1100 cars of oil daily are now being moved out of Norris City, Illinois, carrying in the neighborhood of 10,000,000 gallons (238,000 barrels) for Eastern refineries, according to reports to the Office of Defense Transportation.

Probably the largest tank-car movement from any loading point in the world, the handling of this great number of cars becomes something of a feat when it is considered that all the traffic moves out over a single track which formerly handled only four or five trains a day. To achieve this volume, ODT said, it is necessary to move a 75-car train in and out of the terminal every 52 minutes.

A 1000-car pool of empties is maintained at Mt. Carmel, Illinois, 44 miles from Norris City, where inspections and light repairs are made, and are hauled in lots of 75—all the passing tracks will accommodate, to the big-inch loading racks. All of the oil moves in fast-schedule symbol trains, which make the round trip in 8 to 11 days, depending on the length of haul.

Approximately 60 percent of the crude oil coming out of the pipe line is going to refineries in the Philadelphia area, 34 percent to refineries in the New York-Jersey City area and 6 percent to New England refineries, it was said. When heating oil begins to flow through the line, the distribution will shift, with more of the output going to New England.

Donnell Heads PAW District 2 Committee

Appointment of O. D. Donnell, president of The Ohio Oil Company, as chairman of the general committee for District 2 was announced April 19 by PAW. He succeeds Frank Phillips, chairman of the board of the Phillips Petroleum Company, who has resigned because of ill health.

Paying high tribute to Phillips' services, Deputy Administrator Ralph K. Davies expressed the regret of PAW officials over the necessity for his retirement.

"It was with great reluctance that Administrator Ickes was compelled to accede to Phillips' request that he be relieved of further duties as chairman of the general industry committee in the Midwest," he said. "Phillips has been an indefatigible worker, an inspiring industry leader, and a whole-hearted cooperator with PAW. That he continued his advisory responsibilities despite the strain of ill health during the last several months indicates how willing he has been to further the war program regardless of his personal welfare.

"It is most fortunate, indeed, that at this time we have been able to persuade as able an oil man as Otto Donnell to relieve Phillips of his duty so that the latter might enjoy a well-deserved rest."

Contracts Let for 206 Fast Tankers

Contracts for construction of 469 merchant ships, including 206 high-speed tankers, were announced by the Maritime Commission April 21.

All of the vessels are to be completed by the end of 1944.

Investigators Praise Tanker Program But Charge Fraud on Concrete Barges

The Maritime Commission's program for construction of 115 concrete barges and 50 ocean-going tugs will cost the government at least $250,000,000 under contracts with the MacEvoy Shipbuilding Corporation at Savannah, Ga., and the San Jacinto Shipbuilding Corporation at Houston, Texas, which are marked by "rapacity, greed, fraud and negligence" and have been referred to the Department of Justice for appropriate action, it was revealed April 20 in a report of the Truman Committee investigating the national defense program.

In a study of this phase of the shipbuilding program, the committee recalled that Admiral Land, chairman of the Maritime Commission, testified that the concrete barge program was undertaken with "considerable misgiving," solely as an insurance against not having sufficient shipping.

Investigation showed, it was declared, that most of the barges will not be available until 1944 and the chief use to which they will be placed will be for the dead storage of oil.

The only bright spot in the picture was the committee's belief that the towboats "will be of great utility for other purposes."

The committee had words of praise for the tanker phase of the program, reciting that 62 ships of some 998,000 tons deadweight were delivered in 1942, and that this annual rate has already been more than redoubled with the completion of 12 during the single month of March. Nearly 200 tankers are scheduled to be built this year, with deliveries expected to exceed 20 a month during the latter part of 1943.

"Tanker construction is both complex and difficult, and the availability of the necessary turbo-electric and geared turbine propulsion machinery has been a controlling factor in the expansion of the program," the report stated. "The timeliness with which the large-scale tanker program was inaugurated, and the rapid progress made, reflect favorably upon the Maritime Commission." However, it was commented, a large number of tankers could have been built in commission yards and the Navy program would be further along had it not been for the decision to build a large number of special vessels advocated by the British for uses which have not yet materialized.

Nearly half of the 75-page report was devoted to a discussion of the two barge contracts, investigation of which was initiated in the latter part of 1942 when it was ascertained that none of the barges had as yet been launched, although the program had been underway since the middle of 1941. The committee was further prompted by the disappointing results encountered in the concrete barge construction program during the last war.

Land explained to the committee, the report pointed out, that he had consented to the concrete ship program only because it was intended to provide insurance in the form of additional transportation facilities.

"Twenty months after inauguration of the program in August, 1941, no part of the insurance contemplated has been furnished and the cost in critical materials as well as in labor and money has more than doubled," the committee commented. "It is the opinion of the committee that the concrete-barge program reviewed in the light of developments to date shows a cost which cannot be justified by the additional cargo space created."

And at another point: "It was originally contemplated that reinforced concrete barges could be constructed cheaply and rapidly, that unskilled and building construction labor rather than shipyard labor could be used and that available low grade steel could be used. The program has actually been appallingly expensive and extremely slow."

Materials and Manpower Headline Southwestern API Program

TWO of the oil industry's most critical wartime problems, materials and manpower, will be publicly discussed at Houston during a two-day conference of the Southwestern District of the American Petroleum Institute's Division of Production on April 29-30, 1943, at the Rice Hotel.

Much value is expected to be derived from the conference on the industry's manpower problem, which will take place Friday afternoon, April 30. It affords one of those rare occasions for men of industry not only to hear government representatives express their views, but also an opportunity for them to ask pertinent questions of these men that should clarify confusing points. Two speakers will stress the critical shortage of men, one representing the manpower commission and the other the oil industry, but more importantly they will discuss the procedure that the vital oil industry should use to protect its skilled and required labor from military draft. Speakers will be Dr. F. H. Harbison, Labor Councillor for the Petroleum Administration for War, Washington, D. C., who will discuss "The Manpower Job to be done by Oil Industry," and Henry LeBlanc, acting Regional Director of the Manpower Commission, Dallas, who will speak on "Government's View of Oil and Gas Industry Manpower."

The training of new employes to take the place of experienced ones going into military service is both exceptionally difficult and important, and much interest and value is expected from an address on "Utilization of Existing Vocational Training Methods for Wartime Conditions in the Oil Industry." The speaker will be J. R. D. Eddy, State Department of Education, Austin, Texas. The industry is offered unusual facilities through its employe education program established during peacetimes, and Eddy will tell oil men how it may be used to greater advantage during wartimes.

The question of adequate materials to conduct operations so that the largest quantity of petroleum in history can be produced vies in importance with the shortage of men, and one complete session will be devoted to this topic at the Southwestern meeting. The conference on materials, stressing the use and conservation of supplies in wartime, will be held Thursday afternoon, April 29.

An opportunity is presented for oil men to talk directly with the man who will handle the industry's steel allocations under the government's newly inaugurated "Controlled Materials Plan." He is D. G. Hawthorn, Chief of Equipment Section, Production Division of Petroleum Administration for War, at Washington, D. C., who will discuss "Production of Oil Through the Controlled Materials Plan."

At the same session the value in savings of metals that the industry is contributing to the war as a result of its 18-year old cooperative standardization program will be told by J. F. Lucey, Lurey Petroleum Company, Dallas. The industry can be proud of war donations its standardization program has made possible, and also is to be congratulated on its own savings in operating costs that have resulted from this effort.

A symposium consisting of three short papers on the use of materials in war will conclude the conference on materials. How to conserve steel in producing operations will be discussed by J. B. Martzell, United Gas Pipe Line Company, Shreveport, Louisiana. The story of the API's recent simplification of pipe and tubular goods specifications, which has relieved manufacturing facilities, reduced the use of metals and made the problem of buying and setting casing strings easier for operators will be told by C. A. Dunlop of Humble Oil & Refining Company, Houston. An address on the "Use of Materials in Secondary Recovery," by Paul D. Torrey, consulting engineer of Houston, will show oil men how others are saving materials in these operations, frequently by taking old junk parts and designing unusual contraptions capable of performing necessary duties.

The opening session of the meeting will hear two wartime papers and also reports from chapter officers on the past year's activities. The protection of petroleum facilities and plants from sabotage and bombing is a matter of vital importance, and oil men will be told by Kraus Earhart, of the Petroleum Administration for War's Houston office, of the plans and systems that have been perfected for the industry itself to handle this problem. He also will show a movie on the extinguishing of oil field fires.

One of the outstanding wartime achievements has been the oil industry's construction of substitute transportation facilities to the East Coast, made necessary by the overnight military draft of ocean tankers that formerly moved more than 1,300,000 barrels of petroleum daily from the Southwestern oil region to the heavy consuming New England area. The interesting story of this transportation miracle, its trials and post-war influence, will be discussed by T. E. Swigart, Shell Pipe Line Company, Houston.

In addition to conferences on how the oil industry will meet its wartime material and manpower problems, the meeting will devote one session to drilling and production practices. At this session, to be held Friday morning, April 30, papers will be presented on paraffin removal, reservoir performance, recycling plants, and direct-current rigs.

Reservoir performance control, a subject of growing importance now that oil wells are being called upon to produce larger quantities, will be described in layman language by Stuart E. Buckley of Humble Oil & Refining Company.

The Katy Recycling Plant, one of the largest unitized projects in existence, will be described by Frank D. Noble, Humble Oil & Refining Company, Houston. Pictures and flow diagrams of the plant will highlight this paper.

A recently developed paraffin scraper that reduces the time required to clean accumulations from wells, and thereby saves in cost and manpower, will be featured in a paper entitled "Removal of Paraffin in the University Oil Field," by Benjamin C. Craft of Louisiana State University, and R. F. Nichols of Grubb & Hawkins.

The "Construction and Economic Operation of Direct Current Rigs for Deep Drilling" is the subject of a paper that will be presented by R. A. J. Dawson of the production division of the Petroleum Administration for War. It will also be delivered at this session on drilling and production practices. For several years Dawson has been compiling data for a book on this subject, and his address will outline the findings of his experience and research studies.

WPB Needs Help to Locate All Idle Electric Motors

War Production Board is doing its utmost to locate every idle electric motor and generator and get it back into active service, John Gammell, chief of WPB's Electrical Equipment Branch, said recently in a statement calling upon industry to cooperate with the division by listing idle motors and making full use of its services in obtaining second-hand equipment.

"To assist industry in locating idle motors and generators," he stated, "the General Industrial Equipment Division has set up a used-motor unit in its Electrical Equipment Branch. The unit has a file of about 30,000 used motors and generators including those listed by motor dealers with the OPA and those available in industrial plants. This file, which covers the entire country, is compiled from data received from the WPB field offices and directly from dealers and industrial plants and is kept currently up to date."

The unit's chief function is to serve as a clearing house for owners and prospective buyers of idle motors and generators.

Geological Survey Would Unitize All Public Lands

The United States Geological Survey has recommended compulsory unitization of oil or gas areas, fields or pools, on public lands. Interested parties have been given 60 days in which to file comments, criticisms or suggestions with the Secretary of the Interior, and a hearing may be held before the adoption of the recommendations.

Complete regulation of development in productive areas is contained in the program. A supervisor representing the government would approve all exploratory drilling, including location of wells.

Should a commercial deposit of oil or gas be found, the supervisor would approve all future operations of development, in an effort to protect all unitized land from loss by drainage.

Under terms of the recommendation, each agreement with an operator would be for a term of approximately five years, and for so long thereafter as unitized deposits could be produced in paying quantities.

New AIMME Bulletin

"Petroleum Technology" for March, published by The American Institute of Mining and Metallurgical Engineers, has three articles of interest to petroleum engineers: "Volumetric and Viscosity Studies of Gas and Oil from the Santa Maria Valley Field," by R. H. Olds, B. H. Sage and W. N. Lacey; "Response of a Gulf Coast Drilling Mud to Chemicals, Temperature and Heat-Treatment," by George Fancher and Robert L. Whiting; and "The Use of Electrode Spacing in Well Logging," by Richard H. Zinszer.

PAW Draws on Texas For May Output Boost

May production of all petroleum liquids was set by PAW April 20 at 4,237,400 barrels daily, an increase of 51,300 barrels over the allowable for the current month and 464,200 barrels above the actual May, 1942, production.

Increases totaling 63,500 barrels daily were authorized in 2 states, Texas being given an additional 60,000 and Kentucky 3500 barrels, but reductions were ordered in 10 others.

The reductions were spread over all five districts. In District 1, Pennsylvania was reduced from 50,700 to 50,000 barrels and West Virginia from 18,900 to 17,500 barrels, New York being unchanged at 15,000 barrels.

In District 2, Illinois was cut from 251,900 to 250,800 barrels (300,100 barrels were produced daily in May, 1942); Kansas from 309,900 to 309,700 barrels; Michigan from 63,700 to 62,100 barrels (63,700 barrels last May); Nebraska from 2600 to 2400 barrels, and Oklahoma from 379,300 to 379,000 barrels (416,500 barrels last May). Indiana was unchanged at 16,000 barrels and Ohio at 9700 barrels, and Kentucky was increased from 20,000 to 23,500 barrels; last May, Indiana produced 20,200 and Ohio 10,000 barrels.

In District 3, Arkansas was cut from 78,600 to 73,000 barrels, but Texas was increased from 1,502,000 to 1,562,000 barrels, and Louisiana was left untouched at 359,300 barrels, Mississippi at 50,000 barrels (85,400 barrels a year ago), and New Mexico at 105,700 barrels.

The only cut in District 4 was in Wyoming, from 97,100 to 97,000 barrels, Colorado and Montana being left unchanged at 7400 and 24,600 barrels, respectively. California was cut from 823,700 to 822,700 barrels.

Texas Allowable in May Is 1,601,551 Barrels

The Texas Railroad Commission's order effective May 1, authorizes an estimated production of 1,601,551 barrels of all oils daily, or 20,449 barrels less than the PAW estimate of consumer demand. PAW certified 1,562,000 barrels as the demand for all oils. Subsequently, however, it asked for an additional 60,000 barrels to supply oil to the big-inch pipe line.

Of proratable oils, the commission permitted estimated production of 1,484,000 barrels daily. This figure compares with 1,382,342 barrels, the estimated production under the April order.

The comparative figures, by districts for May 1, and April 1:

District	May 1	April 1
1. Southwest	20,239	20,190
2. Southwest	105,232	89,653
3. Gulf Coast	363,139	331,877
4. Southwest	137,954	127,347
5. East Central	27,773	18,023
6. East Central	98,578	84,385
East Texas	343,498	322,993
7B. West Central	28,456	28,127
7C. West Central	18,628	17,984
8. West Texas	220,526	206,649
9. North Texas	121,560	127,966
10. Panhandle	99,054	97,890
	1,584,637	1,473,084
Less under production	100,086	90,742
	1,484,551	1,382,342
Distillate and nat. gasoline	117,000	118,000
Total	1,601,551	1,500,342

The increases in important fields include:

Field	April 10	May 1
DISTRICT 2		
Keeran	408	586
La Rosa	1,393	1,610
Placedo	3,530	3,854
Placedo, East	497	835
Mauritz	177	200
Mayo	566	650
Refugio, Old	746	853
Tom O'Connor	26,045	37,145
DISTRICT 3		
Anahuac	18,430	24,572
Armour	47	75
Buckeye	80	94
Cedar Point	1,185	2,160
Clear Lake	2,257	3,340
Magnet-Withers	9,665	10,468
Old Ocean	16,044	15,018
Red Fish Reef	1,197	1,890
Sugarland	2,193	3,200
Webster	12,155	24,500
West Columbia	2,019	2,300
DISTRICT 4		
Agua Dulce	1,684	2,600
Alice	728	1,326
Ben Bolt	893	1,800
Flour Bluff	1,125	2,679
East Flour Bluff	353	950
Glen	668	1,136
Hoffman	3,680	5,507
Sun	1,167	1,631
Sun, North	175	330
Tarancahuas	222	491
Tom Graham	573	1,057
Volpe	248	350
DISTRICT 5		
Van	8,897	18,150
DISTRICT 6		
Coke	1,843	2,834
Hawkins	29,273	43,745
DISTRICT 8		
Foster	4,437	4,790
Slaughter	20,577	23,924
Wasson	25,278	25,983
Yates	19,811	22,012
DISTRICT 9		
Seymour	927	1,157

The order provides 21 producing days for all fields except those set out in the subsequent list:

28 Producing days:

District 2. West Ranch, West Mauritz, and Tom O'Connor.

District 3. Lovell's Lake, Amelia.

District 4. Orange Grove, Garcia, Rincon.

District 9. Antelope (Miss. lime), Bindel, Bonita, Chapman - McFarlin, Clingingsmith, Hapgood, Hoefle, Kadane, Kadane Shallow, Mankins, Mueller, Ringgold, Sanders, Scotland, Scotland (Miss. lime), Wilson, Forestburg, Worsham-Steed, and Rock Crossing (Ellenberger).

26 Producing days: Anahuac.

24 Producing days: Magnolia City, Bay City, Estes, Emperor, Slaughter, Waddell, Seymour, Panhandle.

17 Producing days: Wasson.

16 Producing days: Abell Permian, Crane Cowden, Cowden North Deep.

15 Producing days: Abell.

31 Producing days:

District 1. Darst Creek, Imogene, Loma Alta, Luling-Branyon, Pearsall (Navarro) and Salt Flat.

District 2. Cordele, Heyser, Mellon Creek, Mission River, Oakville, Plummer, Victoria, Collier, Mustang, Poth, Tynan and Fagan, Hobson, Hondo Creek.

District 3. Arriola, Bammel, Barbers Hill, Batson New, Beaumont West, Boling, Buckeye, Cedar Point, Clay Creek, Conroe, West Conroe, Cotton Lake, Cotton Lake South, Damon Mound, Danbury Dome, Esperson Dome, Eureka Heights, Goose Creek, High Island, Hitchcock, Hull, Humble, Humble Light, Kubela, Livingston, Lochridge, Louise, Mercy, Magnet-Withers, Manvel Oligocene, Markham, Mykawa, Mykawa New, North Dayton, Orange West, Raccoon Bend Shallow, Raccoon Bend Cockfield, Red Fish Reef, Sandy Point, Stowell, Silsbee, Turtle Bay, Thompson South, West Columbia New, North Withers, North Bay City, Bucksnag, Danbury Dome (5655-foot sand), Hampton, Livingston (Sparta sand), Livingston (Wilcox sand), West Silsbee, South Buckeye, West Columbia, Pinehurst, Kirby, and North Katy.

District 4. Boyle, Charamousca, Casa Blanca, Clara Driscoll (3800-foot sand), Guerra, Kelsey, Eagle Hill, Minnie Bock, Moca, Nichols, Seven Sisters, Sam Fordyce, North Sam Fordyce, Taft, Plymouth, White Point, East White Point, Cadena, East, Quinto Creek and Dulup and Dee.

District 5. Bazette, Mexia, Powell, Richland, Sulphur Bluff, Wortham.

District 6. Boggy Creek, Cayuga, Kildare, Lone Star, Larissa, Pittsburg, Talco and Rodessa.

District 7B. Grogan, Eastland County, Erath County, Loving, Park Springs, Prichard, Reddin, Reddin Frazier, Stephens County, Merkel and Hill.

District 7C. Beddo, Big Lake, and World and Winters.

District 8. Hendricks, Howard-Glasscock, Iatan-East Howard, McKee, Robertson, Jamison-Pollard, Leck, Monroe, Taylor Link, Snyder, Welsh, and Ember Permian, Monahans, Kermit, Russell, and Yates.

District 9. Cooper, Johnson Pool in Cooke County, Fargo, KMA Ellenberger, Hildreth, Hults-Owens, Joy-Mississippi Lime, Antelope, Vogtsberger, Walnut Bend, Padgitt (Mississippi lime), Burns Ragland (Mississippi lime), Knox (Mississippi), Illinois Bend, Holbert Caddo, and Murray and Ellis.

East Texas Given Two Extra Days in April

East Texas was permitted to produce two days more during april, on a special order issued by the Texas Railroad Commission April 19. This increase was granted to comply with the request from PAW for additional oil to be supplied to the big-inch pipe line.

The commission estimated that the daily average production for East Texas for April would be increased 30,000 barrels. As a result, this would increase net production 60,000 barrels daily for the last 15 days of the month, as federal authorities requested.

Oklahoma Allowable Hearing Set for April 28

Oklahoma State Corporation Commission has set April 28, as the date for considering market demands and to fix the state and pool allowables for May. Hearing is scheduled for 11:00 a.m. at Oklahoma City.

Kansas Allowable Hearing April 27 at Wichita

Kansas State Corporation Commission has set April 27 as the date for considering market demands and to fix the state and field allowables for May. Hearing is scheduled for 10:00 a.m. at Wichita.

Arkansas Commission Asks Exception to Space Ruling

The Arkansas Oil & Gas Commission has filed an application for an exception to PAO 11 in behalf of the Dorcheat-Macedonia field of Columbia County. The application asked that operators be allowed to continue to drill wells on an 80-acre pattern. It pointed out that each well so drilled would be equivalent to two wells, since an oil zone and gas-condensate zone can be produced concurrently. For the expenditure of 213 tons of steel necessary in the completion of the average well on 80 acres in this field, there is an indicated recovery of one million barrels of oil and condensate, with four billion cubic feet of gas, the application said. A firm demand exists, continued the application, for both oil and gas, and there are adequate transportation facilities.

Gas Measurement Short Course Suspended

Southwestern Gas Measurement Short Course, regularly held each year at University of Oklahoma, Norman, to provide discussion of all phases of natural gas measurement and control, will not be held this year. The press of war effort and the current demands both for the facilities of the University and also the shortage of manpower in naurtal gas companies are factors instrumental in the decision. The 1944 Course is anticipated, although it, too, is contingent upon forthcoming circumstances.

Transportation Shortage, Military Needs Reflected

Markets continue generally strong, with most products scarce, because of either transportation difficulties or limited supplies of oils themselves.

In the East Coast district the stocks of virtually all refined products are very light, and those of gasoline are seriously short. Instead of improvement in the gasoline inventory situation, it is threatened that further impairment actually will occur, now that warmer weather and longer days are at hand. The East Coast shortages reflect the continuing serious inadequacy of transportation. Apparently, heavy military requirements, for shipment across the Atlantic, are cutting very greatly into the increased supplies that have been made available to the East.

In the Western Pennsylvania refining district there has been further tightening of the markets, with plant owners advancing quotations, although within authorized limits, on some grades of fuel oils, particularly No. 2 and No. 3. There is continued steady demand, meanwhile, for kerosine, bright stocks, and cylinder stocks. Gasoline has come into somewhat increased demand, but no difficulty in meeting the requirements of purchasers is experienced. Neutral oils are in fair demand, although they have not fully recovered from the weakness of recent months.

Middle Western refiners and marketers report continued strong demand for both light and heavy fuel oils, which they are finding difficulty in supplying, because of the shortage of transportation and trouble in providing or finding supplies. There is particular difficulty in meeting requirements of the heavy fuel oils, with very little of them in storage to augment currently produced material. Lubricating oils are in steady demand. Gasoline demand has continued gradually to increase although it still is not great enough to tax the ability of suppliers to meet it.

Refiners of the upper Mid-Continent are making heavy shipments in supplying the continued strong demand for their products, although they have only very limited supplies in storage to supplement their current plant output. The stocks of practically all products are low. In reflection of spring agricultural activity, demand for tractor fuel is especially strong, while requirements for gasoline and kerosine also are relatively heavy.

On the Gulf Coast the markets remain comparatively quiet, with no noteworthy inquiries reported by refiners, and with quotations on most products unchanged.

Last Year's Downward Trend Of Crude Stocks Reversed

Although the industry withdrew over 30,000,000 barrels of crude oil from storage in the last 9 months of last year, in reflection of the sharp reductions of imports and the dislocations in transportation of domestic oils, the drafts on crude stocks have been arrested this year, and there has been a rebuilding of crude inventories in the amount of about 8,000,000 barrels. However, certain grades still are being taken from storage, including Pennsylvania grade, Lima-Michigan crudes, Oklahoma grade and Rocky Mountain grades, while stocks of foreign crude have further dwindled until they have been almost wholly depleted.

Stocks of Illinois-Indiana crudes, sharply reduced in 1942, subsequently have been rebuilt about 2,000,000 barrels. California crude stocks similarly were lowered materially in the last 9 months of 1942, but they subsequently have been increased about 2,000,000 barrels, and they now stand at about the same level as when the Japanese attacked Pearl Harbor. Kansas added a million barrels in 1942 and has accumulated almost another million barrels.

The first reaction to the entry of the

Crude Oil Production in the United States

(Estimates compiled by The Oil Weekly. All figures indicate daily averages, in barrels.)

STATE OR DISTRICT	PRODUCTION IN WEEK ENDED April 17	April 24
Arkansas	71,200	71,600
California	775,300	781,500
Long Beach	32,350	32,900
Midway-Sunset	56,100	55,600
Kettleman Hills	43,900	43,850
Wilmington	94,650	94,200
Rest of State	548,300	554,950
Colorado	6,450	6,450
Illinois	226,950	225,350
Salem	30,400	30,200
Louden	42,100	41,800
Other New Pools	143,250	141,950
Old Pools	11,200	11,400
Indiana	15,900	14,300
Kansas	310,300	318,800
Kentucky	13,150	13,250
Louisiana	346,950	346,400
North	88,900	88,300
South	258,050	258,100
Michigan	60,700	59,350
Mississippi	56,250	53,150
Missouri	95	95
Montana	20,400	21,000
Nebraska	2,150	2,250
New Mexico	97,300	97,350
New York	13,800	13,900
Ohio	11,650	11,750
Oklahoma	339,850	341,450
Oklahoma City	57,150	59,700
Seminole Area	78,850	77,250
Rest of State	203,850	204,500
Pennsylvania	44,500	44,650
Tennessee	35	30
Texas	1,390,450	1,391,400
Upper Gulf Coast	340,800	340,800
East Texas Field	320,050	320,200
Rest of Eastern Texas	100,050	99,950
Lower Gulf Coast	117,150	117,300
Southwest Texas	54,600	54,650
South Central Texas	17,050	17,800
West Texas	214,450	214,550
North Texas	135,100	135,000
Panhandle	91,200	91,150
Utah	10	10
West Virginia	9,100	9,300
Wyoming	92,500	96,200
Total United States	3,904,990	3,919,535

Trends of Operations and Changes in Stocks

Figures on crude stocks are from Bureau of Mines weekly reports; all others from American Petroleum Institute weekly reports, which are estimates on Bureau of Mines basis.

(All figures in thousands of barrels—add 000)

ITEM	Crude Oil Prod. Barrels Daily	Week Ended	Runs to Stills Barrels Daily	Week Ended	Crude Stocks Barrels	Week Ended	Gasoline Stocks Barrels	Week Ended	Gas Oil & Distillate Stocks Barrels	Week Ended	Residual Fuel Oil Stocks Barrels	Week Ended
Highs:												
1939	3,910	8– 5	3,650	10–21	278,607	5–26	87,769	4–22	39,562	10–28	116,237	8–26
1940	3,890	3–16	3,690	6–22	265,865	8–31	102,817	4–20	49,051	10–19	109,135	9–14
1941	4,337	11–22	[1]4,120	10–18	266,187	3–29	99,727	3–29	[1]54,983	11–15	102,448	1– 4
1942	[1]4,337	2– 7	3,961	1– 3	263,208	3–28	[1]109,281	3–14	49,861	11–14	95,857	1– 3
1943	3,949	4–10	3,734	3–27	239,925	4–10	94,159	3–20	42,913	1– 2	72,881	1– 2
Lows:												
1939	[3]1,601	8–26	3,125	2–18	[2]229,127	10–12	71,152	10– 7	20,722	4–15	105,397	4– 8
1940	3,335	11–30	3,370	1– 6	237,339	1–27	79,847	11– 9	23,551	4– 6	102,344	2–10
1941	3,364	1–11	3,490	1–18	240,399	11–15	79,923	10– 4	28,381	4–12	90,914	7–12
1942	3,297	7– 4	3,393	5–23	231,896	12–12	75,934	12– 5	29,240	4–25	72,962	12–26
1943	3,821	1– 9	3,579	3–13	232,191	1– 9	82,420	1– 2	30,732	4– 3	67,007	4–17

Trends in Week Ended:	Crude Oil Production Daily	Runs to Stills Daily	Stocks Week End	Gasoline Production Weekly	Gasoline Stocks Week End	Gas Oil and Distillate Production Weekly	Gas Oil and Distillate Stocks Week End	Residual Fuel Production Weekly	Residual Fuel Stocks Week End
1942:									
January 3	4,038	3,961	244,440	13,797	92,987	3,855	49,357	6,918	95,857
January 31	3,871	3,848	250,740	13,292	97,810	3,817	40,674	6,640	91,189
February 28	4,016	3,675	259,373	12,131	105,635	3,799	34,547	6,813	88,285
March 28	3,820	3,667	263,208	11,663	105,624	3,661	31,756	6,344	83,045
April 25	3,581	3,506	257,073	10,535	102,897	.....	29,240	.....	81,107
May 30	3,877	3,522	255,023	10,478	95,355	.....	31,384	.....	79,628
June 27	3,719	3,581	253,364	10,713	88,396	.....	32,851	.....	77,304
July 25	3,691	3,658	249,262	10,864	82,281	.....	35,966	.....	77,816
August 29	3,964	3,697	249,007	11,300	80,831	.....	42,060	.....	78,034
September 26	3,909	3,802	242,785	10,954	80,550	.....	45,945	.....	78,943
October 31	3,901	3,731	239,266	11,153	79,159	.....	48,131	.....	79,166
November 28	3,878	3,736	234,850	11,269	78,854	.....	49,739	.....	77,796
1943:									
January 2	3,871	3,734	233,938	10,957	82,420	4,285	42,913	7,683	72,881
January 30	3,826	3,698	233,863	10,339	88,830	3,888	37,057	7,452	70,763
February 27	3,873	3,709	235,217	10,566	93,157	4,230	32,939	7,839	70,140
March 27	3,896	3,742	239,126	10,231	94,079	3,541	30,980	8,018	67,938
April 3	3,918	3,624	239,864	10,361	93,409	3,903	30,732	8,209	67,483
April 10	3,949	3,677	239,925	10,182	93,212	3,823	30,906	7,681	67,185
April 17, 1943	**3,907**	**3,672**	.....	**10,370**	**92,121**	**3,911**	**30,926**	**7,937**	**67,007**
April 18, 1942	3,545	3,537	[4]258,442	11,005	104,226	3,267	29,929	6,869	82,577
Change:									
In week	—42	—5	+61	+188	—1,091	+88	+20	+256	—178
In year	+362	+135	—18,517	—635	—12,105	+644	+997	+1,068	—15,570
In year	+10.2%	+3.8%	—7.1%	—5.7%	—11.6%	+19.7%	+3.3%	+15.5%	—18.8%

[1] All time peak. [2] Lowest since April, 1922. [3] Lowest since October, 1922, due to shutdown of six Mid-Continent States. [4] Stocks, April 11, 1942.

Fluctuations in Crude Stocks, by Grade or Origin, Since Pearl Harbor

(Thousands of Barrels)

GRADE OR ORIGIN	Outbreak of War for U.S. Dec. 13, 1941	High for 1942-1943 (March 28, 1942)	Low for 1942-1943 (Dec. 12, 1942)	Latest Data (April 10, 1943)	Change from Mar. 28, 1942	Change from Dec. 12, 1942
Pennsylvania Grade	3,633	3,431	3,054	2,763	— 668	— 291
Other Appalachian	1,529	1,522	1,356	1,429	— 93	+ 73
Lima-Michigan	1,233	1,549	1,208	1,035	— 514	— 173
Illinois-Indiana	18,243	19,337	9,494	11,417	— 7,920	+ 1,923
Arkansas	2,591	2,977	2,068	2,322	— 655	+ 254
Kansas	7,400	7,669	6,898	8,737	+ 1,041	+ 1,839
Louisiana	12,348	13,669	12,732	14,020	+ 351	+ 1,288
Northern	3,849	4,223	4,745	4,438	+ 215	— 307
Gulf Coast	8,499	9,446	7,987	9,582	+ 136	+ 1,595
Mississippi	2,202	2,445	1,174	1,232	— 1,213	+ 58
New Mexico	6,781	7,510	5,622	6,974	— 536	+ 1,352
Oklahoma	51,562	50,513	40,111	37,837	—12,676	— 2,274
Texas	81,676	96,123	102,130	104,121	+ 7,998	+ 1,991
East Texas	20,549	23,677	24,468	23,589	— 88	— 879
West Texas	18,070	23,961	24,252	23,998	+ 37	— 254
Gulf Coast	23,935	25,889	28,388	29,633	+ 3,744	+ 1,245
Other Texas	19,122	22,596	25,022	26,901	+ 4,305	+ 1,879
Panhandle	.....	.....	4,670	5,327	.....	+ 657
North	.....	.....	7,491	7,466	.....	— 25
South	.....	.....	4,879	4,565	.....	— 314
Other	.....	.....	7,982	9,543	.....	+ 1,561
Rocky Mountain	16,267	16,628	13,934	13,760	— 2,868	— 174
California	34,574	38,454	31,965	34,200	— 4,254	+ 2,235
Foreign	2,644	1,354	150	78	— 1,276	— 72
Total Gasline-bearing in U. S.	242,683	263,208	231,896	239,925	—23,283	+ 8,029
Heavy in California	10,128	11,336	10,607	10,576	— 760	— 31

United States actively into the war, for a period of over 3 months, was a backing up of crude in storage, in the amount of over 20,000,000 barrels, including 16,000,000 barrels in Texas, 4,000,000 barrels in California, 1,000,000 barrels of Illinois - Indiana oils, over 1,500,000 barrels in Louisiana, nearly 1,000,000 barrels of New Mexico crude, and smaller additions in other areas. The high following Pearl Harbor was reached on March 28, 1942, following which steady withdrawals occurred, affecting nearly all districts.

Between March 28, 1942, and December 12, 1942 (low point so far), when over 30,000,000 barrels came from storage, the principal withdrawals included those of 10,000,000 barrels of Illinois-Indiana crudes, 10,500,000 of Oklahoma grade, 4,000,000 barrels California light and 1,000,000 California heavy, 2,500,000 Rocky Mountain crudes, 2,000,000 for New Mexico, and around 1,000,000 barrels each of Arkansas, Kansas, Louisiana, Mississippi, and foreign crudes. Texas, however, accumulated about 6,000,000 barrels.

Since December 12, 1942, the nation as a whole has added 8,000,000 barrels, with additions in Illinois-Indiana, Kansas, South Louisiana, Mississippi, New Mexico, Coastal Texas, and California more than offsetting withdrawals of Lima-Michigan, North Louisiana, Oklahoma, Rocky Mountain, foreign, and inland Texas (East, West, North, and South) grades.

Present levels of crude stocks of all grades are shown in an accompanying table, together with changes since the high of last spring and the low of last winter.

Imperial Oil to Drill Saskatchewan Tests

Imperial Oil Company's development department of Calgary, Alta., has decided to drill some test wells in the vicinity of Melrose, and a start has been made in the hills southeast of Eston, Sask.

The work is being carried on in three shifts, F. Hamilton being in charge of the survey. The work is expected to take several months.

Refinery Output of Products In Line with Current Needs

Having maintained refinery runs only nominally lower than in the previous week, the industry during the week ended April 17 approximately met the demand for the principal products from current production, with the result that changes in stocks were satisfactory. There was a 20,000-barrel addition to stocks of gas oil and distillate fuel, with production of that product 88,000 barrels greater than in the preceding week. Requirements of heavy fuel oil were not quite satisfied from current production, despite some stepping up of plant output, and 178,000 barrels were withdrawn from storage. A little over a million barrels of gasoline came from storage, a normal change in stocks for this time of the year, although production was 88,000 barrels greater than in the previous week. Crude oil continued to go to storage in the week ended April 10, latest period for which figures are available. Production of crude oil in the week of April 17 averaged 3,907,000 barrels daily, down 42,000 from the previous week, and for that week some crude may have been taken from storage.

Crude runs to stills in the United States averaged 3,672,000 barrels daily in the week ended April 17, down 5000 from the previous week but 135,000 barrels or nearly 4 percent above the runs in the corresponding week last year.

At 239,925,000 barrels on April 10, U. S. crude stocks were up 61,000 barrels from a week before but 18,517,000 barrels (7 percent) under the level on April 11 a year ago.

Stocks of gas oil and distillate fuel were increased 20,000 barrels in the week ended April 17 to 30,926,000 barrels, and that quantity was almost exactly a million barrels (3.3 percent) greater than the 29,929,000 barrels on hand April 18 last year.

Stocks of residual fuel oil in the United States were reduced 178,000 barrels in the week ended April 17, to a total of 67,007,000 barrels. The latter quantity was 15,570,000 barrels (nearly 19 percent) less than the 82,577,000 barrels reported April 18 last year.

U. S. stocks of finished and unfinished gasoline were reduced 1,091,000 barrels between April 10 and April 17, and on the latter date totaled 92,121,000 barrels, which amount was 12,105,000 barrels (11.6 percent) less than the 104,226,000 barrels held April 18, 1942. This reduction in gasoline inventories is fairly well in line with the decrease which has occurred in the demand for that product.

The American Petroleum Institute, source of all figures above except those on crude stocks, reported last week that its index of civilian supplies of gasoline, light and heavy fuel oils on the Eastern Seaboard reached a new 1943 low of 28.1 percent of normal on April 17, compared with 28.8 percent on April 10 and 60.1 percent on September 12, 1942.

Crude Oil Prices Raised For Special Purposes

Increases in ceiling prices of crude in two fields of Illinois and Wyoming, authorized by the Office of Price Administration, effective April 28, are intended to stimulate production in one instance and correct an inequality in the other.

OPA on April 22 authorized an increase of 10 cents a barrel for crude in the Plymouth pool, McDonough County, Illinois, effective April 28, making the new ceiling price $1.05 per barrel. Ohio Oil Company, owner of the pool, had applied for the increase in order to make possible a secondary recovery program requiring a considerable outlay of capital expenditures to increase total production from the pool.

Also effective April 28, OPA authorized an increase of 8 cents a barrel in the price of black oils produced in the Elk Basin field, Park County, Wyoming. The new ceiling price is 90 cents a barrel. The revision brought the involved crude in line with ceilings for black oils of other fields in Wyoming.

East Texas Salt Water Disposal 170,500 Barrels

Injection of salt water produced in the East Texas field through input wells drilled below the oil level in the Woodbine sand had been stepped up to an average of 170,500 barrels daily in mid-April, according to Bryan Payne, president of Iowa-Payne Oil Company and head of the East Texas Salt Water Disposal Company. The co-operative water disposal concern is operating on a field-wide basis, and was returning 90,500 barrels daily through key wells situated on the north and west flanks of the structure.

The firm is expanding its facilities as equipment and labor permit. Essential equipment for the treating of the brine and drilling of additional input wells is not always available in spite of the high priority rating given the project.

Levelling off of the reservoir pressure decline can be attributed to the increased volume of water being returned to the Woodbine, according to Payne. Weighted average pressure for the field rose 4.3 pounds to 1020.44 pounds on the April 1 survey compiled by Texas Railroad Commission engineers.

ELLIOT C. GRANDIN has been appointed sales manager of Titusville Forge Division of Struthers-Wells Corporation, with headquarters in Titusville, Pennsylvania. George C. Johnson was made assistant sales manager.

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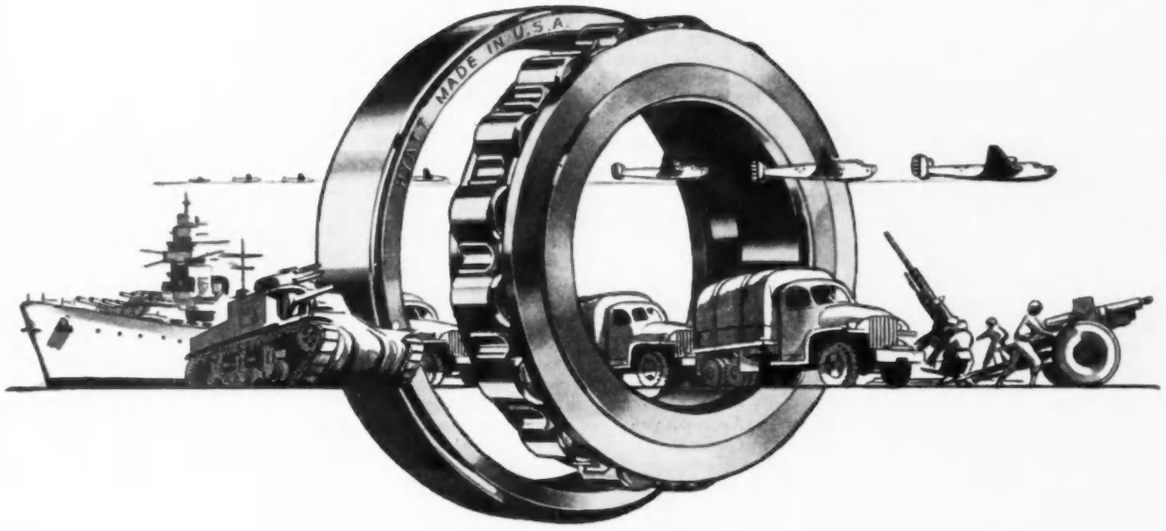

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HYATT ROLLER BEARINGS

Colombian Group Told That Government Will Fully Protect Foreign Capital

DR. NESTOR PINEDA, Colombia's minister of mines and petroleum, speaking before the first convention of the Colombian Petroleum Institute at El Centro, said the Colombian government is pleased with the cooperation of foreign capital in the development of the national reserves of the country. With regard to petroleum, he emphasized that Colombia's legal administration would guarantee and protect foreign capital and expressed the hope that the activities of the oil industry would be beneficial to both the country and the oil companies.

The minister also expressed the government's satisfaction with the organization of the Colombian Petroleum Institute, which he said should provide beneficial results for the country through its activities. He was introduced by Dr. Felix Mendoza, president of the institute.

The convention was held on March 27, 28, and 29, in El Centro, in response to the invitation of Dr. P. F. Shannon, manager of Tropical Oil Company at that location, and was attended by 64 members of the institute and the following guests: Dr. Pineda, A. Chapman and J. Murrel, members of the petroleum administrator's staff in Washington, Dr. Carlos Escallón, chief counsel of Andian National Corporation.

Members arrived from throughout Colombia at Barranca Bermeja and went by special train to El Centro. The convention visited offices, residences, gas plant, power plant, dehydration plant, Andian station, and other installations of Tropical Oil Company, and Dr. Shannon welcomed the convention in the opening address of the program.

Following an address by Dr. Pineda, two technical papers were presented: "Dehydration and Desalting of the Petroleum Products of the Mares Concession," by B. F. Zwick, but presented by Dr. S. Cadavid, and "General Geology and Summary of the Infantas and La Cira Fields," by W. Mulholland. Chapman delivered an address concerning the importation of materials for the oil industry.

The institute visited the Casabe field, across the Magdalena River from Barranca Bermeja, and saw the transitory picture of an oil company changing from exploration to exploitation.

The convention inspected Tropical Oil Company's 14,000-barrel refinery and the installations of the company's marine department in Barranca Bermeja.

In the second general meeting of the convention, the following papers were presented by their authors: "Operation of the Refinery," by M. Matheson; "Refinery Laboratory," by R. Donald; "Report Covering the Work Relative to the Preparation of a Spanish-English Dictionary of Terms Used in the Oil Industry," by D. McArthur; "Correlation of the Stratigraphic Nomenclature of Colombia," by W. Hatfield, and "Activities of the Andian Pipe Line," by Dr. Carlos Escallón.

Technical papers dealing with acidication of oil wells and a bibliography of geological books and papers on Colombia were distributed.

Present officers of the Colombian Petroleum Institute are: Dr. F. Mendoza, president; J. O. Bower, H. B. Richardson, and R. L. Morris, directors; Dr. R. Valencia Samper, secretary and treasurer; and P. H. LeFevre, auditor.

Canadian Government Forms Oil Drilling Company

To expedite development of marginal Canadian oil sites, the Canadian government has formed Wartime Oils Limited, with head office at Calgary, it has been announced at Ottawa by the Department of Munitions and Supply.

Wartime Oils Limited is the 26th Crown company formed by the Canadian government for wartime purposes. The new company will assist in financing available sites in proven areas of the west flank of Turner Valley in Alberta. Its establishment, according to Canadian Oil Controller George R. Cottrelle, Toronto, does not mean that the government is going into the oil business or that the government will finance drilling in other than proven locations. Wartime Oils Limited is one of companies which has been set up by the government to finance, purchase, rebuild or manufacture wartime requirements. One of the companies is a mining concern with a number of producing mines established since its inception early in 1942.

President of Wartime Oils Limited is A. A. Carpenter of Edmonton, Alberta. Directors are Col. L. D. M. Baxter of Winnipeg; Grant Spratt and A. H. Mayland, both of Calgary, Alberta.

Drilling to Start Soon In Vermilion Field

Officials of the Alberta Public Utilities Commission state that representatives of Cannar Oils Ltd., subsidy of Canadian National Railways, which is to drill 50 wells in the Vermilion oil field, have been obtaining information concerning drilling rights and payment of compensation to holders of surface rights in the area.

Drilling operations are expected to be commenced shortly, with groups of three and four wells being drilled at a time.

Under provincial legislation, the utilities board has authority to fix the amount of compensation which must be paid landowners when oil development is undertaken.

New South American Law Firm to Help Operators

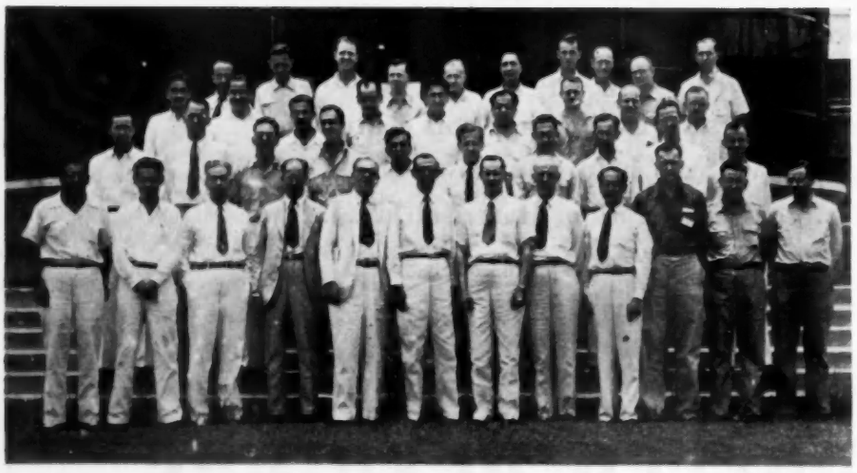
Bufete Arcaya is the name of a new law firm recently organized in Caracas, Venezuela, for the purpose of aiding in the solution of problems arising from new income tax legislation and new reforms to the petroleum laws of that country.

Members of the firm have been trained in Venezuela and also in the United States.

Dr. Petro M. Arcaya is a graduate of the University of Caracas, is a specialist in civil law, patents, financial legislation, oil and mines. He is former Venezuelan Minister to the United States; Ex-Minister of Interior; Ex-President of Congress and associate Justice of the Supreme Court. He is also chairman of various committees in charge of drafting Venezuelan legislation.

Dr. Ignacio L. Arcaya is a graduate of the University of Caracas, specializing in commercial law, patents and trade marks.

Dr. Mariano J. Arcaya is a graduate of Princeton University, George Washington University of Law, and also the University of Caracas. His specialty is Venezuelan-American problems, conflict of laws, income-tax, corporation law and allied matters.



Members of the Colombian Petroleum Institute held their first convention at El Centro, heard technical papers read, and saw properties of Tropical Oil Company.

Turner Valley Operators Disappointed with Increase

Operators at Turner Valley have expressed disappointment over an increase of 15 cents per barrel recently posted by Imperial Oil, Ltd. The new schedule provides a price of $1.50 per barrel for 33- to 33.9-gravity oil, increasing 2 cents per degree to a top of $2.12 for 64 gravity; average for the field is 43-gravity for which $1.70 is paid. The increase is the first change in prices in this field since July 16, 1942. There is no change in the price of natural gasoline, quoted since July, 1941, at $2.28 per barrel for 26 Reid vapor pressure product.

Alberta Petroleum Association for a long time has been advocating an increase for Turner Valley crude but the association has not specified the amount of the increase it desired. Some oil men have expressed the view that it should be boosted 50 cents or more a barrel. Also the argument was advanced that a larger field price for Turner Valley crude oil would stimulate development in the field and thus maintain or increase production which has been declining of late because of the comparatively few wells drilled during the latter part of 1942.

New Jersey Venezuelan Units to Combine

Stockholders of the two Venezuelan affiliates of Standard Oil Company (New Jersey), Creole Petroleum Corporation and Lago Petroleum Corporation, held special meetings in New York April 22 and 23, respectively, to vote on a plan for reorganization and consolidation to effect economies for both groups and simplify dealings with the Venezuelan government, through one management. Creole has been operating in Eastern Venezuela and Lago in Western Venezuela.

Under the consolidation plan, Creole would increase capital stock from 7,000,000 to 27,000,000 shares of $5 par value and issue to Lago 19,946,658 shares in exchange for assets to be transferred to Creole. Lago has outstanding 4,000,000 shares of capital stock, $1 par value.

Lago assets to be transferred to Creole include 100 percent of stock of Lagomar Oil Concessions, Inc., and Compania de Petroleo Lago. Lagomar, to be dissolved, has 49,000 acres of concessions in Lake Maracaibo, and Compania de Petroleo Lago has a small concession in Lake Maracaibo, a refinery at La Salina, some shallow draft tankers, and storage and marketing facilities.

Standard Oil Company of Venezuela, wholly owned operating subsidiary of Creole, will be liquidated and its assets transferred to Creole, which will become an operating company.

Standard of Venezuela has a net interest of about 4,406,000 acres under concession and has developed important crude reserves. About 79 percent of Creole's crude reserves are in the Quiriquire, Jusepin, and Mulata fields, and it holds unproved acreage, the more promising of which is on the Junepin-Maturin trend. During 1939, 1940, and 1941, Creole's production averaged 96,000 barrels daily, but the average dropped to 68,000 daily in 1942 because of transportation difficulties. Only about 6 percent of Creole's crude reserves are in the Lake Maracaibo area.

Lago Petroleum Corporation holds a net interest of about 1,500,000 acres under concession and has developed large oil reserves principally in the Lake Maracaibo region. During 1939-1940-1941 production averaged 180,000 barrels daily, but in 1942 transportation shortage cut output to 128,000 daily.

Concentrated in the Lake Maracaibo area, Lago's production finds outlet through lake tankers to the Aruba refinery. The company has only relatively small holdings in Eastern Venezuela, where Creole is strongly entrenched. The proposed consolidation therefore would increase Lago's participation in the light crude oil reserves of Eastern Venezuela, whereas the company's reserves heretofore, mostly in the Lake Maracaibo area, consisted of less than 1 percent light crude and over 99 percent heavy crude (below 30 gravity). Reserves controlled by Creole consist of 36 percent of light crude and 64 percent of heavy crude, largely concentrated in Eastern Venezuela.

Dominion to Drill in North British Columbia

Tentative arrangements are now being worked out under which the Dominion of Canada will drill for oil in the near future in the northern part of British Columbia. Indication to this effect was given in the legislature recently by Premier John Hart.

The premier said he could not go into details, but he indicated that of the oil resources developed the province probably would retain a 50 percent interest and the dominion 50 percent, with an option held by the province to buy out the dominion's interest at a later date.

Shell to Resume Drilling Jasper Park Deep Test

Drilling of its deep-test well near Entrance, in the Jasper Park forest reserve, will be resumed by Shell Explorations (Alberta), Ltd., at once, S. H. McCuaig, counsel for the company, said recently.

McCuaig said he had been advised that the company has decided to complete the well and will start drilling shortly. At last reports, it had drilled to 4700 feet.

Report Says Tax Policy To Stop Oil Development

The Canadian government's present policy is bound to bring crude oil production in Turner Valley to an end, except in the case of companies fortunate enough to establish reserves in cash or production sufficient to drill more wells, and in the process denying further dividends to their shareholders.

That is one of the findings of the 350-page report of W. C. Fares, whose analytical survey is regarded by many operators as of even greater value than the McGillivray commission's study made four years ago.

One of the aims of the Fares report was to present the facts relating to Turner Valley production, marketing and taxation so as to demonstrate the severe handicap under which the oil industry is now operating in Canada's only major producing field. It is based on the performance of 194 producing wells.

A study of the report develops the conclusion that Turner Valley on the average has been profitable to primary producers—that is, those who invested in drilling projects either by shares or royalties, but that heavy income and excess profits taxation turn these profits into serious capital losses in all cases where the initial production is less than 600 barrels of oil per day.

Petroleum Statistics Index Compiled by Librarians

Special Libraries Association, 31 E. Tenth Street, New York, has issued an Index to American Petroleum Statistics. This subject guide to petroleum statistics contains a list of 42 publications together with name and address of publishers and prices, so it may be used as a buying list for petroleum statistics. The index is arranged alphabetically by subject with subdivisions into specific items, and by localities. Cross references have been inserted where they will be helpful. The index has been compiled by Bradford A. Osborne, Head Technical Department, Tulsa Public Library, and issued by Special Libraries Association. The price is 50 cents plus three cents postage.

New Oil and Gas Map Of Arkansas Available

A new oil and gas map of Arkansas with a portion of Texas, Oklahoma and Louisiana included, has been completed by the Oil and Gas Commission of Arkansas, and is ready for distribution.

The map is correct as of March 1, this year, and shows oil and gas fields, oil and gas pipe lines, refineries, gasoline plants, desulphurization plants, principal highways, railroads and principal towns and cities.

Texas Safety Association Stresses Industrial Safety

Industrial safety as related to war production will be the theme of discussions at the annual meeting of the industrial section of the Texas Safety Association to be held in Houston, at the Rice Hotel, April 27 and 28.

Among papers and talks to be given are "Cause Classification of Accidents," by R. B. Roaper, chief safety engineer, Humble Oil & Refining Company; "Explosions in Compressed Air Systems," by T. D. Brown, safety engineer, Shell Pipe Line Company, Colorado City, Texas; "Safety Problems of Women in Industry," by Mrs. Louise McKellar, women's counselor for Hughes Tool Company; "Rehabilitating the Injured Employe," Dr. Herbert F. Poyner, Houston industrial physician.

A panel discussion will be conducted by Harvey Williams of Pan-American Refining Company, Texas City, and the discussion session will be presided over by Kraus Earhart, Sr., security engineer and acting director of facilities securities division, Petroleum Administrator for War, Houston.

William Grant, Jr., is general arrangements chairman for the meeting.

DR. J. L. RICH addressed the Houston Geological Society April 15. He is from the University of Cincinnati, and spoke on "Problems in South American Geology as Suggested by an Aerial Traverse." The talk was illustrated by selected views from over 900 photographs taken from the air during an extensive tour of South America.

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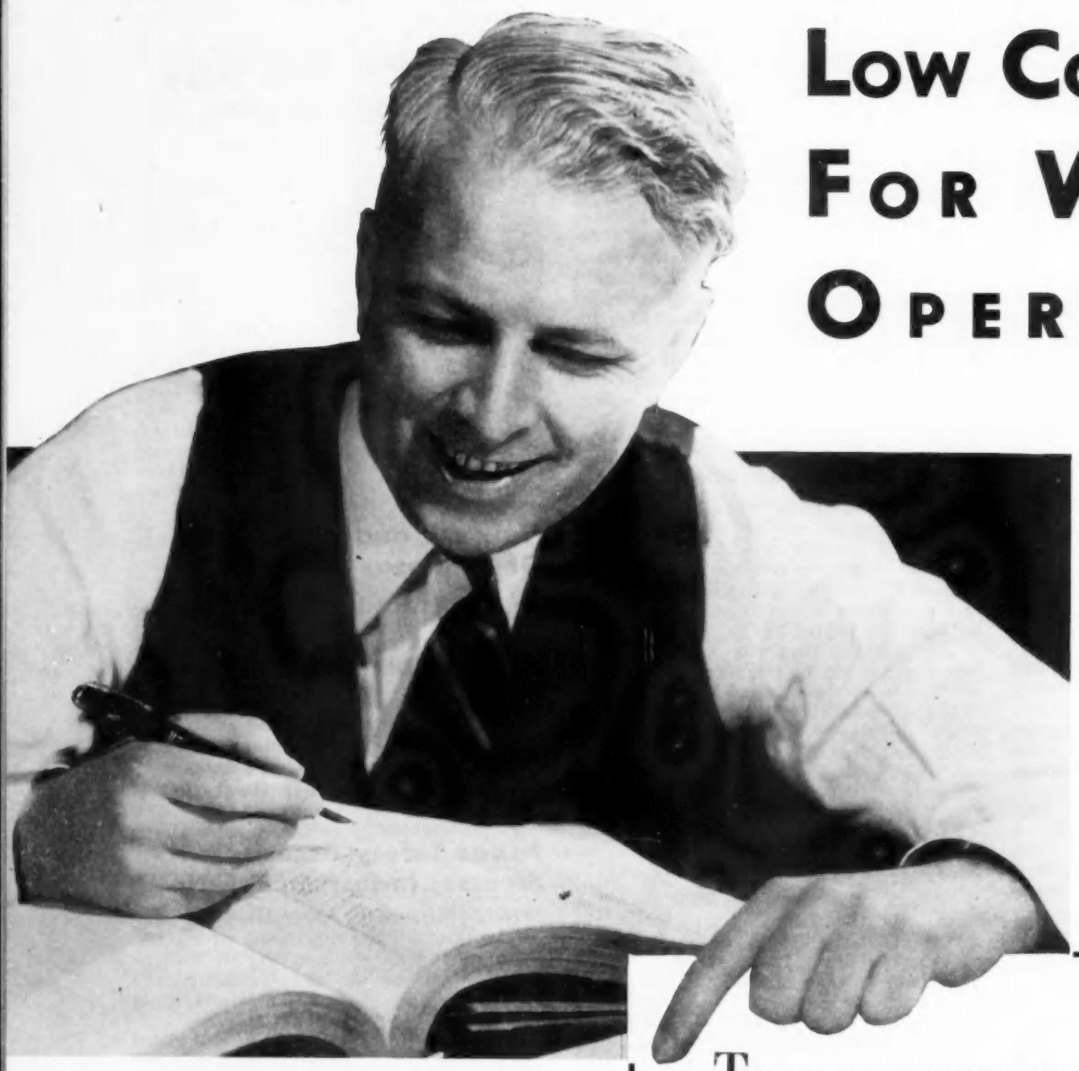

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U. S. Field Operations

Illinois Basin

New Pool Indicated For Jefferson County

Byers' and Ellison's Jefferson Oil and Gas Company 1, NE SE NE 32-3s-2e, Jefferson County, 1½ miles northeast of Waltonville, swabbed 5 barrels of oil an hour and a slight amount of water after casing was milled out opposite Bethel sand at 2266-80 feet. The test was drilled some time ago and abandoned but recently was reopened and deepened to the Aux Vases which failed to produce. It then was plugged back to the Bethel. The same operators drilled Jeff Oil & Gas Company 2 before reworking the older well, but abandoned the hole.

Hamilton County: Gussman's Mead 1, SE NE NW 23-5s-6e, 1½ miles northeast of the Hoodville pool, recovered 2500 feet of oil on a 30-minute drill-stem test of McClosky lime at 3207-22 feet. Seven-inch casing was being set. The test appears to be the first successful wildcat in the county for many months.

White County: W. C. McBride, Inc.'s Bailey 1, SW SE 3-7s-9e, a wildcat, was drilling below 2360 feet after finding saturation in a Pennsylvanian sand at 1525-32 feet. On a drill-stem test of the comparatively shallow sand, 60 feet of oil and 70 feet of mud were recovered in one hour.

Wabash County: Superior Oil Company's Beeman 1, 9-1s-12w, a wildcat, was drilling below 2500 feet although a show of oil was found in Benoist sand at 2160-82 feet which yielded 20 feet of oil and 25 feet of oily mud on a drill-stem test.

Franklin County: Lario Oil & Gas Company's Franklin County Mining Company 3, NE SW SW 36-6s-4e, 1½ miles south of the new South Akin field and a probable pool opener, was still not a completion. Casing has been set to Aux Vases sand at 3122-27 feet.

Lawrence County: A revival of activity for this county was indicated by three first reports, all in unproved territory. They were: DeKalb Agricultural Association's King 1, SE NE SE 8-2n-12w, location; Bonnie Heath's Boyd 1, NW NW NW 24-2n-12w, location; and J. E. Bauer's Warner 1, NW SE NE 24-3n-11w, rigging up cable tools.

Clay County: Tidewater Associated's Davis 9, C SW NE 15-5n-5e, scheduled to be the first Devonian test in the Iola field, may be completed in the McClosky lime, one of the pool's four producing zones. On a drill-stem test of the McClosky at 2409-23 feet, 1250 feet of oil and 200 feet of oil-cut mud were recovered in 60 minutes. Location has been staked for an outpost to the field, Joe V. Dunbar's Huber 1, SW SE NW 17-5n-5e.

Kentucky

Union County: Trans-Tex and Ashland Oil & Refining Company's Newman 1, C SW SE 13-0-19, wildcat 2½ miles west of Morganfield, swabbed one barrel an hour natural from Biehl sand at 1428-46 feet.

H. H. Weinert's Greenwell 1, SW NE 11-0-20, wildcat two miles west of Waverly, was drilling at 800 feet.

Webster County: Sinclair-Prairie Oil Company's Higginson 1, C E½ SE NW SW 10-N-23, wildcat 2 miles east of Poole, set casing on broken McClosky saturation at 2660-2716 feet. One hour drill-stem test at 2662-2747 feet showed 140 feet oil-cut mud and no water.

Henderson County: Iley B. Browning's Humphreys 1, SW SW NW 7-P-21, wildcat 1¼ miles northeast of Poole, is moving in cable tools to test Tar Springs sand at 1952-66 feet.

Creekmore-Rooney's Priest 1, 16-P-26, Shell Oil Company farm-out, is a new wildcat location.

A. L. Slayter and H. H. Vickers' Gish 1, NW SE NW 6-0-25, center of the old Pennsylvanian sand Niagara pool, is moving in rotary to test McClosky at about 2400 feet.

Oklahoma

Old Well Opens New Gas Field in Hughes County

Abe Gutowsky et al's Wagner 1, NWc SW 32-14n-4w, Oklahoma County, 3 miles west of Edmond field, which was plugged back from 7676 feet to test Hunton lime after perforating casing at 6952-57 feet, flowed 28 barrels of oil per hour for 17 hours through 1/16-inch choke after tubing was run. Well is producing 41-gravity oil.

Garvin County: With Ohio Oil Company's Burns 1, SE NE SW 17-3n-2e, still out of control after encountering an estimated 75,000,000 cubic feet of dry gas in Pennsylvanian sand at 2876 feet more than two weeks ago, crews have started drilling a relief well. The relief well, located 250 feet south of Burns 1, will be a directional hole and when completed mud will be pumped through it in an attempt to kill the gas flow at the discovery.

Pottawatomie County: Hall & Briscoe's Dierker 1, C SW SW 19-9n-2e, west of Tecumseh and near the Cleveland County line, is considered a field opener after swabbing 10 barrels of oil hourly from Hunton lime, which was treated with 5000 gallons of acid. Casing was perforated for the Hunton test after pipe was set at 6224 feet. Wilcox was dry at 6232 feet. Well is still swabbing.

Hughes County: Burke-Greis Oil Corporaton's Hamilton 1, W½ NE SW 33-4n-9e, is being completed for new gas pay in the Citra area with production gauged at 22,500,000 cubic feet daily. Production is from Cromwell sand at 4204 feet. Exceptions are to be made to drill other gas wells in the area. Carter Oil Company drilled the well in 1938 but passed up the gas to drill on to 6177 feet for a dry hole. The agreement for Burke-Greis to complete the well as a gas producer was made later.

Creek County: Started in 1940, A. J. Whitfield et al's Jack 1, SE SW 27-16n-10e, is being completed as a Dutcher sand producer in the Slick area. Pay was topped at 2634 feet and the well flowed 150 barrels of oil in 13 hours through choke.

Kansas

Stafford, Pratt Counties Each Get New Field

Phillips Petroleum Company's Spangenberg 1, NE SE 21-22s-12w, Stafford County, opens a new pool three miles southeast of Drach field, with production from Arbuckle lime at 3691-97 feet. Well pumped 97 barrels of oil and no water in 6½ hours after 500-gallon acid application. Well was scheduled for an additional 2000 gallons of acid. Total depth is 3697 feet.

Reno County: Skelly Oil Company's Cleo Johnson 1, C SW NE 6-24s-10w, which extended the Zenith pool northeast and toward Peace Creek field production, flowed 135 barrels of oil in 2 hours through 1-inch choke after it was treated with 1000 gallons of acid. The pay, Viola lime at 3721 feet, was given another acid treatment prior to additional testing. A north offset, Cleo Johnson 2, also a Skelly operation, is drilling below 3315 feet.

Pratt County: A new pool for Pratt County six miles northwest of Iuka field appears certain as a result of tests at Stanolind Oil & Gas Company's Frisbee 1, C SE SW 5-26s-13w. Saturation capable of commercial production was found in the Lansing-Kansas City lime at 3930-32 feet. Well is now drilling below 4110 feet toward the Arbuckle lime. If no other shows are found, it will be plugged back and perforated at the Lansing-Kansas City pay.

New Mexico

Lea County Ordovician Test May Produce

Lea County's first Ordovician test showed promise of making a producer from Basal Simpson when R. Olsen Oil Company and Atlantic Refining Company's Langlie 1, east edge of Langlie field, tested ½-barrel of 44-gravity oil hourly on initial swabbing test after using 5000 gallons of acid through perforations at 8980-9020 feet. Additional perforations will be made in trying to attain a commercial producer from Simpson series, topped at 8250 feet, while several zones in the Lower Permian are prospective oil zones. Langlie 1 entered Ellenburger, which failed to produce after acidizing through perforations, at 9110 feet followed by granite at 9560-92 feet.

San Juan County: Continental Oil Company, Stanolind Oil & Gas Company and Standard of Texas' Tocito 1, C NW SW 17-26n-18w, wildcat on a 8160-acre block, cemented 7-inch at 6700 feet with hole bottomed in Elbert at 6897 feet to complete as a gasser to be turned to the U. S. Bureau of Mines. Gas recovered when tester used at 6659-6700 feet showed Helium content. The partnership's Navajo 1, C NE SW 13-29n-19w, was assigned to the Bureau of Mines when completed last year in

Lower Magdalena at 6950 feet, and road is being built for the drilling of Bichla-Bi-To 1, NE SW NE 13-30n-21w, also a deep test.

West Texas

Keystone Deep Well Making Oil Producer

Prolific flow of high-gravity oil below a 300-foot gas-distillate zone in Ellenburger was uncovered by Amon G. Carter's Walton-Pure 2-C, deep strike for the Keystone structure, Winkler County, giving the Permian Basin another important addition to its crude reserves. Top of the gas-oil contact was tentatively called at 9524 feet, or 307 feet in Ellenburger dolomite. Drill-stem test at 9494-9541 feet with tool open 52 minutes yielded 33 barrels of 46.6-gravity oil on 30-minute gauge through separator and at end of 20 minutes the volume of gas was rated at 11,730,000 feet daily. Second test at 9530-65 feet with tool open 93 minutes showed 40 barrels of oil on 30-minute gauge and maximum flow of gas at end of one hour rated at 2,365,000 feet daily. Hole is to be carried deeper before running 7-inch through the gas-distillate zones. This strike will automatically receive bonus allowable of 200 barrels daily for 18 months.

Magnolia Petroleum Company's Walton-State 20, situated 3½ miles to west and on a parallel but deeper seated structure, showed gas with distillate and rotary fluid spray on incomplete drill-stem test at 10,562-10,607 feet, and was to deepen. Four drill-stem tests were made since entering Ellenburger at 10,460 feet, 1264 feet low to the Keystone discovery, averaged 10 barrels of 54-55 gravity distillate hourly with maximum of 12,800,000 feet of gas daily. Bottom-hole pressure readings ranged from 4550 to 4700 pounds, with maximum of 3100 pounds flowing pressure.

Stanolind Oil & Gas Company and Shell Oil Company's Blue 1, east edge of Winkler County, was drilling lime at 9600 feet, having entered Montoya, Upper Ordovician at 9245 feet. It is to be carried to Ellenburger.

Hale County: Amerada Petroleum Corporation's Kurfees 1, C NW NW H&OB 6, Block N, near center of east line of county, is contracted to 11,000 feet, or water in Ellenburger. This wildcat is 33 miles north by east of Lubbock County's shutin discovery pumper, nearest production, and is north of the deep-seated granite ridge that extends east-west across the Permian Basin.

Crockett County: Moore Bros. et al's Todd-Amerada 1, 5 miles west of Crinoidal production in West Todd field, has plugged back from barren Ellenburger at 7645-7903 feet to set 5½-inch at 7160 feet and complete through perforations in Crinoidal saturation at 6800-65 feet. It will be the third Crinoidal strike for the county.

Pecos County: Standard Oil Company of Texas' Douglas 1, scheduled Ellenburger test for southwest edge of the Yates field, was drilling lime and shale at 6740 feet, with top of Pennsylvanian tentatively placed at 6530 feet. Phillips Petroleum Company's Price 1, deepest test for county, was drilling at 10,175 feet. Bryce McCandless et al's University 1, 7 miles south of Apco field, was drilling at 5170 feet, possibly in Ellenburger. Magnolia Petroleum Company and Anderson-Prichard Oil Corporation's Powell-State 1, 1½ miles northeast of Apco field, cemented pipe to exclude Upper Permian water after blowing out while fighting crevice at 3552-57 feet. Well made prolific flow of 24-gravity oil, then oil and water. Top of porosity in Clear Fork was called at 3540 feet with elevation of 2405 feet.

Stephens County Well Flows Wild From Bend

J. D. Hancock and associates' Black 1, SWc of TE&L 1144, uncovered flush production in a sparsely explored sector of north central Stephens County, flowing wild for 19½ hours through casing after using 4000 gallons of acid through Bend perforations at 3252-71 feet. This semi-wildcat kicked off after second run of the swab rated above 1000 barrels of oil daily. The unrestrained flow caused water to break through, and the well was producing 2,600,000 feet of gas and 500 barrels of fluid daily, averaging 20 percent bs&w, when shutin. Tubing will be installed for official gauge.

North Texas

Central Archer County Has Deep Oil Showing

Central Archer County has promise of a deep oil discovery through Bobby Burns et al's Wilson-McCrory 1-A, ATNCL 107, having logged broken oil saturation in Bend at 4847-70 feet and in Ellenburger at 5206-37 feet. Pipe will be run to test. This wildcat is 6 miles northwest of Archer City. Phillips Petroleum Company's Wilson-Luke 1, 3½ miles due east, was drilling at 3180 feet on a 5500-foot depth contract.

Montague County: Continental Oil Company's Kaneaster 1, east offset to its discovery producer in the Hildreth pool and south offset to a 7200-foot Simpson well, confirmed the upper pay as being an important oil zone in yielding a steady flow of oil when tester was used in conglomerate at 6076-6118 feet of Bend series, topped at 6025 feet. Seven-inch is set at 6076 feet to complete. This well also yielded 826 feet of oil and 60 feet of oil-cut mud from Basal Strawn sand at 6007-22 feet.

Trading: Gulf Oil Corporation completed its third purchase of drilled-up properties in the heart of the K-M-A field paying $500,000 cash for E. C. Oil Company et al's Mangold "A" 80-acre lease with 4 Strawn and 2 Ellenburger flowing wells, having base allowable of 241 barrels daily. Gulf is negotiating for additional properties in the field in order to bolster the supply of sweet crude for its Fort Worth refinery.

Young County: Standard Oil Company of Texas and Hanlon & Buchanan, Inc.'s Donnell 3, southwest offset to their Murray pool discovery, flowed 99.4 barrels the first 3 hours and 98 barrels the next 3 hours on ¼-inch choke with 650 pounds flowing pressure on tubing and 685 pounds on casing after using 1000 gallons of acid in Mississippian at 4529-31 feet. Pay is 53 feet low to discovery. The partnership's Donnell 2, northwest offset to the discovery, entered Mississippi 107 feet low, and abandoned in Ellenburger, thus revealing sharpness of the structure. An east outpost is underway.

East Texas

Third Paluxy Oil Field Opened in Wood County

Third Paluxy oil strike for Wood County within 10 months materialized when Bobby Manziel et al's Bailey-Shell 1, Samuel Burch survey, flowed 20 barrels of 36.2-gravity oil with some rotary fluid per hour on brief tests through ¼-inch choke from four stages of perforations between 6244 and 6319 feet. Electric survey placed the main pay at 6261-74 feet in top of Paluxy. This strike is four miles southeast of Coke field but separated by a decisive failure, and 4¾ miles northeast and on a geological strike with the Quitman field. Magnolia Petroleum Company holds two direct offsets. Interval between this discovery and the Quitman field was shortened one mile when Roger Lacy et al's Stone & Johnson 2, Anderson survey, flowed 181 barrels of 42-gravity oil on 6-hour official gauge through ¼-inch from perforations at 6310-35 feet in Paluxy sand, topped at 6302 feet with elevation of 446 feet. It is credited with an aggregate of 45 feet of oil sand. Water table was established at 6355 feet being normal for the field.

Franklin County: Production test was pending for Tide Water Associated Oil Company and Seaboard Oil Company's Bacon 1, John Maximillian Survey, Block 12, which has indicated production possibilities in Rodessa sand from 3 zones in Travis Peak at 7902-11, 7930-44 and 7952-59 feet. This wildcat is bottomed at 8089 feet, with 5½-inch at 7900 feet, and is due to make an oil producer after drilling plugs. Partnership has virtually solid lease on 6000 surrounding acres, thus restricting interest to royalty trading.

Van Zandt County: Royal Petroleum Corporation's Key 1, 2½ miles southeast of Wills Point, was drilling at 7225 feet in Rodessa, topped at 7112 feet, and contracted to 7500 feet. Key 1 logged unusually thick beds of Woodbine sand, and first 20 feet of Paluxy, topped at 5696 feet, showed possible oil production that will undoubtedly encourage further prospecting in the area. Delta Drilling Company-Beckett & Torrans' Smith 1, S. L. Flowers Survey, 2½ miles northwest of Grand Saline, was drilling at 5890 feet in Georgetown, topped at 5320 feet with elevation of 419 feet.

Robertson County: Magnolia Petroleum Company's Anderson 1, 2½ miles northwest of Calvert and on an 18,000-acre block, was due to abandon at 5185 feet in shale after recovering 1200 feet of salt water from Edwards limestone, topped at 4828 feet with elevation of 337 feet and logged to 5096 feet.

Henderson County: Stanolind Oil & Gas Company's Tri-Cities 1-B, 1⅜ miles northeast of Tri-Cities pool, was awaiting production test through perforations at 8276-8306 feet in Pettit, having proved dry at 8410-50 feet. Company's Tri-Cities 1-D, ¾ mile southeast of discovery, maintained high structural position in logging top of Travis Peak at 8330 feet, and was repairing rig at 8447 feet. Three zones in Rodessa showed an aggregate of 79 feet of probable producing formation.

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Southwest Texas

More Wildcat Drilling Planned in Jackson County

Outside of the widespread leasing and development interest in the Karnes-Bee County trend, major activity last week was centered on wildcat and semi-wildcat work in Jackson County. Although no fields have been opened in the latter area in several months, there still is considerable wildcat activity and with many more wells planned. Extension wells also are being drilled extensively through the Southwest area with flank sands and new pays occasionally being opened.

Bee County: Bridwell Oil Company has been making drill-stem tests on St. John 1, wildcat one mile north of Beeville in J. Hefferman survey. One test at 3540-48 feet recovered 90 feet of oily mud and 275 feet of oil and salt water with a small working pressure. The formation tested is believed to be the Vicksburg. Although it is not believed sufficient sands have been encountered in this well to make a large producer, there has been a flurry of trading for leases and more wildcats probably will be drilled in the area.

Simmons Oil Company has junked Briam 1, old wildcat that was deepened to the Wilcox, due to crooked hole. The well, located 1½ miles southeast of Oakville townsite, was carried to 6240 feet. The rig was skidded 45 feet northeast for a replacement hole, in Dennis McGowan survey. The new test is scheduled to drill to around 8000 feet or 700 feet in Wilcox.

Duval County: L. H. Wentz has extended oil production on the northwest flank of Sejita gas-distillate field, south portion of the county. Wentz's Salinas 1 flowed 550 barrels of 42.5-gravity oil through ¼-inch choke from perforations at 5767-72 feet. Total depth is 5795 feet with 7-inch casing set to total depth. Gas sand was found at 5700-18 feet, oil sand at 5759-79 feet.

Jackson County: M. K. Womack et al are preparing to drill Scheblack 1, wildcat 5 miles east of Edna and 2½ miles southwest of Mustang Creek discovery. Location is in block 12, Sutherland Pasture subdivision, Thomas Menefee survey. Stewart & Edwards are preparing to drill Brandes 1, a half mile northwest of north flank production at North LaWard. It is in Pickering Ranch subdivision of Jessie White league.

Karnes County: Transwestern Oil Company is making production test on Sellers 1, prospective Pettus-sand discovery 7 miles southeast of Runge. Operators set 5½-inch casing to 4194 feet after drilling to 8015 feet, the contract depth in Wilcox. A drill-stem test in Pettus at 4120-24 feet showed 210 feet of pipe-line oil, no water, with 450 pounds working pressure. This apparent discovery is in the northeast corner of block 3, Shaw and Harris subdivision of Victor Blanco grant.

ERNEST WOOD, 58-year-old oil field contractor and owner of a casing pulling company, died Thursday, April 15, at his home in Shawnee, Oklahoma. Death was due to a heart attack.

Texas Gulf Coast

Old Ocean Field Gets Important Extension

Field and extension locations showed an increase in the coastal sector last week with new tests being projected at Stowell, Aldine and Gillock. Also holding interest are two wildcats, the first in the Alief area of Harris County and the second in the Sugar Valley area of Matagorda County. A major extension to the Old Ocean field of Brazoria County has been completed, thus broadening this large gas-distillate reserve in Matagorda County.

Harris County: Cities Service Oil Company is preparing to make first flow test on Witcher 1, wildcat three-quarters of a mile northeast of Pure Oil Company's gas-distillate discovery at Alief. Bottomed at 8708 feet, 5½-inch casing was cemented to make perforations in Yegua sand found at 7885-7930 feet, logged about 20 feet higher than in the discovery which was completed in perforations at 7919-24 feet. Pure has drilled dry holes west and southwest of the discovery.

The Aldine area of Harris County, which has not had any drilling for two years, will be revived with Texas Gulf Producing Company staking location for Weary 2 on 151-acre tract in E. Farrias survey, lot 38.

Matagorda County: Superior Oil Company is drilling deeper in Peterson 1, wildcat in Sugar Valley area, having set 7-inch casing to 10,665 feet in sidetracked hole. This well attempted to

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blow out and stuck drill pipe in the original hole, was plugged back and sidetracked to recore the gas or oil sands. Location is in A. S. Sojourner survey.

Tide Water Associated Oil Company has extended Old Ocean production 3500 feet northwest on Matagorda County side of the field, with McDonald 1 flowing 113 barrels of 37 gravity oil in 6 hours through ¼-inch choke with 1925 pounds pressure on tubing and 2575 pounds on casing. Perforations were made around 10,074 feet and 10,100 feet.

Locations: More edge and extension drilling is scheduled with American Republics Corporation, Houston Oil Company and Southwest Settlement and Development staking Fee 1 in Camp Eleven area of Tyler County. It is a proposed 8010-foot test.

The Texas Company has spotted Steele-Schmucker 1, at Stowell in Jefferson County. It is on a 40-acre unit in L. Lopez survey 37. It is west of production with a contract depth of 8800 feet. Pan American Production Company has located Peters 2 on a 1750-acre lease in John W. Lytle survey, and is a deep projected semi-wildcat test. Contract depth is 10,500 feet.

Hardin County: Earl C. Hankamer et al have abandoned Merchant et al 1, flank test on southeast side of South Lake dome, at 4190 feet in salt. This well is on the side where a fairly steady drilling program has been carried on by Hankamer to develop flank production. Location is on a pooled unit in Stephen Jackson survey. Operators so far have drilled three producers and two dry holes.

Louisiana Gulf Coast

Pine Prairie Well Testing Wilcox

Considerable interest is focused on a deep test on the west flank of Pine Prairie dome, Evangeline Parish, which is making a flow test in Wilcox. If productive, this well will be the first to produce from this deeper horizon and will touch off a flurry of deeper drilling. The flanks of the dome produce from the Cockfield and two sections in Sparta. The discovery of the Vacherie field in St. James Parish has been recompleted as a gas-distillate producer, thus opening another coastal field.

Evangeline Parish: Roy Lee, Jr., (H. L. Hunt) is making production test on Crowell-Spencer 1, on the west flank

ADVERTISING RATES

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■ 2700 acres farm and ranch in Washington County, on all weather road, in J. M. Westfall, Samuel Gates and Wm. Gates Surveys; part in Brazos River bottom, black land and creek bottom; live water, pastures set with bermuda, Johnson, some mesquite grass and clover; many pecan trees; mineral rights intact. Hunter Yarborough, Navasota, Texas.

■ 410 acre ranch and stock farm. Live oak and pecan trees on the streams. Good grass in pastures. Fertile fields. Large modern home with more than city conveniences and three car garage. Many barns, corrals and two tenant houses. Geologists say oil structure. Sixteen miles northeast of Austin. On railroad. Selling cheap to settle estate. Stolley Estate, Norwood Bldg., Austin, Texas.

FOR LEASE

■ FOR LEASE: 800 acres in La Salle Parish, La., surrounded by production. Write P. O. Box 607, Tullos, La., or call phone 42.

HELP WANTED

■ Will consider employing Geologist familiar with East Texas and Louisiana areas. Address P. O. Box 708, Gladewater, Texas.

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■ **Immediately available all types of printed forms generally used by oil companies. Lease forms, daily production and gauge reports, priority, purchase and emergency order forms, labor time sheets, daily truck drivers reports, material and pipe tally forms, etc. Complete catalog on request. Address Oil Form Dept., Gulf Publishing Company, Houston, Texas.**

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Abandoned Pipe Lines, in or out of the ground, Oil Wells, Steel Buildings and Steel Storage Tanks of all sizes.

JOS. GREENSPON'S SON PIPE CORP.
National Stock Yards, St. Clair Co., Illinois.

of Pine Prairie salt plug in Section 35-3s-1w. Although details have not been released, the hole was drilled to 10,605 feet and casing was cemented near bottom to test.

Gulf Refining Company has spotted a southeast edge test at Pine Prairie, Schlicher-Thomas 1-C, an east offset to C. I. Production Company and Kirby Petroleum Company's Haas 1 Sparta-sand well. Projected depth is 9200 feet which should be a thorough test of Sparta sections.

St. James Parish: Humble Oil & Refining Company has recompleted Panno & Bossetta 1, 8-12s-16e, gas-distillate discovery in the Vacherie area. Casing was perforated at 10,763-80 feet and flowed 96 barrels of condensate and 2,520,000 cubic feet of gas daily through 3/16-inch choke with 3850 pounds pressure on tubing. This hole was drilled to 10,895 feet and plugged back to 10,830 feet. Humble's Colonial Sugars 1, Hester area, Section 5-12s-5e, is making hole below 4110 feet in shale.

Terrebonne Parish: Superior Oil Company is attempting to recover 33 stands of drill pipe in LaTerre Land 3, Lake DeCade area. Operators drilled to 10,654 feet in sidetracked hole where the pipe twisted off, leaving drill collar, bit, and pipe in the hole.

East Baton Rouge Parish: William Helis et al are preparing to make another flow test in Nelson 14, deep test in University field. First perforations were made at 9638-44 feet and squeezed. Reperforations were made at 9623-30 feet but these holes yielded salt water. These latter perforations have been squeezed preparatory to making further tests.

California

Navy Completes Four Wells on Elk Hills Reserve

The United States Navy last week began filling bunkers from its own wells in the big Elk Hills Naval Reserve. Two strings of tools are in operation as a start on a program which it has been stated may run into some hundreds of wells, and results from first completions augur well for substantial relief of California's threatened fuel-oil shortage.

U. S. Navy 85-G, first of the new wells, made an initial of 488 barrels of 21-gravity oil and the second, U. S. Navy 38-27S, rated 460 barrels of 19-gravity oil cutting 8 percent. Another pair then was finished in short order, one for 360 barrels of 23-gravity and the other 66 barrels of 23.4-gravity Depths of this production range from 2950 to 3290 feet. Gravity of the oil being below 24 degrees in the particular zone selected for this production, it is suited to present needs of the Navy in the Pacific.

Other phases of the general campaign to step up California's daily productive capacity of crudes high in fuel oil content now are developing rapidly. At the week-end reports were current the PAW had completed its revision of well-spacing regulations to facilitate California heavy oil development. Once this order is effective, if it is as helpful as unofficial reports of its provisions indicate, there will be a decided pick-up in starts of new heavy-oil drilling projects.

Fresno County: Approaching further tests of the newly discovered Guijarral Hills field should give new clues as to richness of the pay, and contours. These are Standard Oil Company's second well in the discovery section and R. S. Lytle's offset on the next section north, respectively drilling at 8067 and 7721 feet.

Superior Oil Co.'s Cantua Creek wildcat, Cantua Lds. 54-36, 36-17-15, now nearing 10,000 feet, is reportedly in Eocene, which would indicate results will be known shortly.

Kern County: Tide Water Associated Oil Company may have got off the edge with its try for an extension of the East Strand field, KCL 76-8, 8-30-2, a test at 8370 having yielded 400 barrels a day, 75 percent water. Top of gray sand was at 8232 feet. Good-looking sand was found at 8203-8223 feet, and efforts are being made to locate source of the water.

Los Angeles County: Shell's noise-proof, mid-city deep test, Verne Comm. 1, in Los Angeles, now drilling near 8000 feet, will soon reach decision; and, if unofficial scout reports are correct, indications so far are not encouraging. No information is being released but scouts believe nothing commercial so far has been found and give it one last chance, which is that it might pick up the equivalent of the Sentous sand of Inglewood field above 9000 feet.

Michigan

Second Completion Confirms Cedar Field

Ohio Oil Company's Zimmerman 2, S½ SE NE 28-18n-9w, Cedar field, Osceola County, flowed 192 barrels of oil in 21 hours on test from Dundee lime, marking the second producer for the field, 1320 feet north of the discovery. It cored Dundee and set 5-inch casing through horizon to 3887 feet, testing top of Monroe formation which carried water at 3929-32 feet. Bottom hole was cemented and pay section of Dundee at 3821-26 feet was perforated.

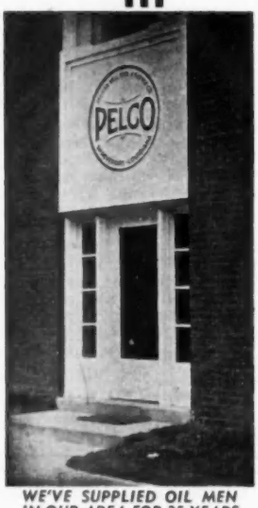
Clare County: Rowmor and Leonard's Throop 1, S½ NE NE 11-20n-6w, four miles northeast of West Winterfield pool, drilled Dundee dolomite objective dry at 3773 to 3782 feet, and abandoned. A new wildcat has been located tentatively a mile east to further explore this district which is leased on a checkerboard basis by several companies.

Missaukee County: C. L. Maguire, Inc., will drill to 3800-foot Dundee section on Medbury 1, Section 23-22n-6w, a mile north of Prosper field. Hole was drilled with rotary to 1655 feet to check upper markers, and will be standardized and completed with cable tools.

Gas Field Sale: Dow Chemical Company has purchased from Taggart Brothers Company the Evart gas field, Osceola County, including 13 producing wells and about 4500 acres of leases. The field was developed last year on a 160-acre pattern. Wells range from 250,00 to 8,000,000 feet from Michigan Stray sand at average depth of 1500 feet. Without a pipe line, all wells have been shut in since completion except for minor withdrawal for field fuel. Dow has a pipe line to within five miles of the field.

They want us to "Tell All!"

Again we have a personal, pointed letter from The Oil Weekly suggesting we "Tell All." What is this — the third degree? We know people who insist on telling all, and we don't like 'em. Furthermore, we don't trust 'em. There was a time we told customers a lot of things in great detail and a little condescendingly. That was thirty-five years ago. We have found that customers often know more than we do about much of the stuff we sell. We might also remind The Oil Weekly that a war is on. You can't be too specific without arousing false hopes. We are satisfied to have a growing number of rather smart supply and equipment buyers TRY PELCO FIRST. And whose advertising money is this, anyway?



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United States Well Completions

CALIFORNIA

Fresno County—Coalinga Old Field: General's Esperanza 117, se sw sw 6-20-15, pump 43 bbls oil, 10 water, 145 ft perf 1232 ft, td 1233 ft.

Shell's 124-34, se sw nw 34-19-15, pump 15 bbls oil, 37 water, perf 2714-2653, 2638-2602, 2587-2558, 2543-2463, 2380-2314 and 2294-2256 ft, black shale 2248 ft, Kreyenhagen 2708 ft, td 2717 ft.

Kern County — Belridge South: General's Belridge 22-12, sw nw ne 2-29-21, pump 40 bbls 16.5-gr oil, 12 water, perf 619-885, 925-990 ft, td 1157 ft, pd 990 ft.

General's Belridge 22-12, nw se nw 12-29-21, pump 50 bbls 16.4-gr oil, 10 water, perf 835-859, 878-985 and 1010-1021 ft, td 1120 ft.

Kern County—Elk Hills: U. S. Navy's 45-1G, ne ne sw 1-31-24, pump 266 bbls, perf 3288-3240, 3200-3142 ft, td 3310 ft, pd 3290 ft.

U. S. Navy's 65-2G, ne nw se 2-31-24, pump 74 bbls oil, 22 water, perf 2870-2948 ft, td 3058 ft, pd 2950 ft.

U. S. Navy's 85-2G, ne ne se 2-31-24, pump 488 bbls 21-gr, perf 2915-3068 ft, td 3135 ft, pd 3070 ft.

U. S. Navy's 38-27 S, sw se sw 27-30-24, pump 423 bbls 19-gr oil, 37 water, perf 3000-3049, 3069-3105, 3125-3165, 3205-3219 ft, td 3219 ft.

Kern County—Kern Front: Standard's 39, sw ne ne 15-28-27, pump 64 bbls oil, 27 water, 254 ft perf 2278 ft, td 2280 ft.

Kern County—Midway-Sunset: North American Oil Consolidated's Lockwood 77, se nw ne 16-32-23, pump 36 bbls 16.5-gr oil, 14 water, 6⅝-in 1826 ft, completed 1490 ft, td 2605 ft, pd 1830 ft.

Standard's 92-19D, se ne sw 19-32-24, pump 17 bbls 20.6-gr, 6⅝-in 2588 ft, completed 2555 ft, td 2919 ft.

Texas Co.'s 26, se nw ne 36-31-22, pump 100 bbls 16-gr oil, 13 water, perf 2449-2329, 2268-2177, 2107-2078 and 2008-1919 ft, td 2450 feet.

Los Angeles County—Montebello: Standard's Baldwin 103, sw se se 36-1-12, pump 6 bbls oil, 23 water, 552 ft perf 2747 ft, td 2828 ft, pd 2750 ft.

Los Angeles County — Wilmington: Long Beach Oil Development Co.'s "W" 53, 640 ft nely along n/l Seaside Blvd fr e side 27th Ave thence 785 ft sely at r/a, flow 59 bbls 12.9-gr, 22/64-in, 40/70 lbs, perf 2337-2428, 2448-2529 ft, td 2531 ft.

Orange County — Huntington Beach: McVicar-Rood-McCallen's Fee 1, 250 ft s 362 ft w c/1s Grafield & Hampshire Sts, pump 74 bbls oil, 6 water, 40 ft perf 3692 ft, oil sand 3633 ft, td 3692 ft.

Sacramento County—Rio Vista: Texas Co.'s Welch 3, 32-4-3 flow 7,000,000 gas, ½-in, 1500/1640 lbs, perf 4050 ft, 5½-in incl 202 ft perf 4270 ft, completed 4064 ft, green sand 4020 ft, white sand 4104 ft, td 4270 ft.

Ventura County—Padre Canyon-San Miguelito: Continental's Grubb 28, sw se ne 23-3-24, flow 97 bbls 30-gr 16/64-in, 200/525 lbs, perf 6760-6850 ft, td 7528 ft, pd 6900 ft.

CALIFORNIA WILDCATS

Fresno County—Failure: Richfield Oil Co.'s Cantua Co. 1, 14-17-15, Cantua Creek area, sandy shale, no oil or gas, abnd 5100 ft.

Fresno County—Failure: Amerada's Hancock 56-23, 23-17-19, Riverdale area, formation tests 6636-6658 and 6643-6658 failed, abnd 6900 ft.

Tulare County — Failure: Union-Continental's Pacific States 76-25, 25-22-25, Pixley area, slate, rubble and conglomerate, top basement cored at 4840 ft, abnd 4926 ft.

Ventura County — Failure: Spencer D. Coates' Pirie 5, 7-4-22, Ojai area, red shale (Sespe), abnd 1033 ft.

ILLINOIS

Clay County: Texas Co.'s Joliff 1, c ne ne se 16-5n-5e, abnd 2385 ft.

Texas Co.'s Bloemker 6, c se sw nw 3-5n-7e, L. Weiler 2523-36 ft, 101 bbls, 2538 ft.

Effingham County: W. R. Braun's Trimble 1, c nw nw sw 26-6n-5e, Rosi 2433-38 ft, 65 bbls, 2441 ft.

H. Luttrell et al's See 3, c se nw ne 34-6n-5e, Ben 2286-2308 ft, 39 bbls, 2372 ft.

Fayette County: Carter's Doty 5-D, c se nw 2-8n-3e, Dev 3127-30 ft, 97 bbls, 3131 ft.

Hamilton County: Gulf's Lockowood 2, c nw se 15-6s-5e, abnd 3410 ft.

Texas Co.'s Dial 1, c nw ne sw 7-6s-5e, Aux V 3123-43 ft, 42 bbls, 3334 ft.

Jefferson County: Duncan & Oberling's Ragan 3, c nw ne sw 25-2s-1e, Ben 2010-15 ft, 30 bbls, 2015 ft.

Nash Redwine's Randolph 6, c ne sw sw 27-3s-3e, Aux V 2713-40 ft, 165 bbls, 2746 ft.

Lawrence County: Smith & Nye's Spidel-Hoovermale Cons 2, sw nw nw 23-2n-12w, Biehl 1352-85 ft, 240 bbls, 1385 ft.

W. E. Bailor's Hershey 2, c nw se sw 26-2n-12w, abnd 1430 ft.

St. Clair County: Tarlon Oil Co. and Sklar Oil Corp.'s Dryoff 1, c nw se se 28-1n-10w, abnd 1800 ft.

Wabash County: Cities Service's Foster 1, sw se se 3-1s-13w, abnd 2470 ft.

Cecil Kneippe's Sturgeon 1, c nl nw ne 12-1n-12w, abnd 1435 ft.

Washington County: Magnolia's Gill Est 11, c nw sw nw 26-3s-3w, Ben 1270-85 ft, 28 bbls, 1291 ft.

Harry Schwarz' Pytlinski 1, ne nw nw 13-3s-2w, abnd 1376 ft.

Wayne County: Cities Service's Boggs 1, nw nw ne 32-2s-9e, abnd 3380 ft.

White County: Jarvis Bros. and Marcell's Gardner 5, se ne ne 3-4s-11e, Mansfield 1469-76 ft, 80 bbls, 2436 ft.

Carter's Austin A-1, nw nw sw 17-6s-9e, Ben 2770-91 ft, 33 bbls, 2791 ft.

Fred Capshaw et al's Barnes 1, c nw nw ne 13-6s-10e, abnd 2878 ft.

ILLINOIS WILDCATS

Edwards County: Nelson Dev. Co.'s A. Reid 1, c se sw nw 16-1s-10e, abnd 3388 ft.

Franklin County: Oil Management Inc.'s U. S. Coal & Cke Co. 1, c ne nw nw 25-5s-2e, abnd 2920 ft.

Jefferson County: Nash Redwine's Prudential Life 1, sw se sw 27-3s-3e, abnd 4759 ft.

Marion County: Cameron Bros.' Binnion 1, c sw nw sw 2-4n-1e, abnd 1771 ft.

Montgomery County: C. D. Kidder's Carpenter 1, se ne ne 8-8n-5w, abnd 520 ft.

St. Clair County: G. A. Morris' Englerth 1, sw sw ne 31-1s-8w, abnd 274 ft.

Washington County: Texas Co.'s Herrmann 1, se se sw 33-2s-4w, abnd 1425 ft.

Wayne County: Gulf's Pierce 1, c ne ne sw 26-2n-6e, abnd 3420 ft.

ILLINOIS WILDCAT DEEPENED

Franklin County: E. S. Adkins' Brown Est. 1, c se ne nw 25-7s-2e, otd 2138 ft, L. O'Hara 2756-64 ft, 182 bbls, 2875 ft.

INDIANA

Posey County: Lelalu's Dickhaut 2, nw sw ne 19-6s-12w, abnd 2747 ft.

Vanderburg County: K. Y. Bixbee's Glaset 1, c sl ne nw 31-5s-11w, 50,000 gas, Penn sand 468-86 ft, td 494 ft.

INDIANA WELL DEEPENED

Gibson County: Mo-Bu-Stro Oil Co.'s R. Dugan 1, se se nw 35-2s-9w, otd 1074 ft, abnd 1132 ft.

INDIANA WILDCATS

Spencer County: Ira Huff et al's Huser 1, nw nw ne 31-6s-5w, abnd 1255 ft.

KANSAS

Barton County—Kraft-Prusa: Solar Oil Co.'s Schartz 5, nw sw ne 18-16s-11w, Arb 3280 ft, pump 203 bbls, 500 gals acid, 3293 ft.

Barton County—West Prusa: E. G. Bradley and Marilyn Oil Co.'s Holder 1, ne ne se 12-16s-12w, Arb 3365 ft, abnd 3397 ft.

Ed Bradley and M. Lassen's Dolechek 1, ne ne ne 13-16s-12w, Sooy sd 3330 ft, pump 512 bbls, 3339 ft.

Transwestern's Rude 1, ne se nw 1-16s-13w, Arb 3373 ft, abnd 3440 ft.

Cowley County — Couch: Adair - Morton's Marble Savings Bank 1, ne nw nw 13-30s-5e, Bartles 2825 ft, flow 401 bbls, 2837 ft.

Cowley County—Deichman: Trees' Franks 3, se nw se 23-31s-4e, Bartles 2880 ft, shot 75 qts 2890-2920 ft, pump and flow 917 bbls, 2920 ft.

Cowley County — Geuda Springs: Arthur Brewer and Adams' Aumann 1, se sw nw 33-33s-3e, Bartles 3272 ft, shot 20 qts, pump 25 bbls, 3324 ft.

Jefferson County—McLouth: Magnolia's Edmonds 2, 21-9s-20e, Miss 1482 ft, shot 30 qts, pump 15 bbls, 1485 ft.

Marion County — Lost Springs: Westgate-Greenland's Martin 1, c w½ nw nw 10-17s-4e, Miss 2322 ft, abnd 2388 ft.

Harwood Oil Co.'s Thompson 3, c nw ne 26-17s-4e, Miss 2328 ft, pump 50 bbls oil and small show wtr, 2392 ft.

McPherson County — Lindsborg: Carter's Rasmusson 2, c w½ ne se 18-17s-3w, Viola 3347 ft, 2000 gals acid, pump 118 bbls, 3358 ft.

Dickey Oil Co.'s Frantz 2, c w½ ne se 24-17s-4w, Viola 3390 ft, 2500 gals acid, pump 672 bbls, 3395 ft.

Rice County—Chase: Bishop Oil Co.'s Callis B-1, c s½ se 16-19s-9w, White Lansing 2870 ft, 8000 gals acid, pump 65 bbls oil, 25 wtr, 3265 ft.

Aylward & Tatlock's Link 1, c se se 18-19s-9w, Lansing 3122-25 ft, 500 gals acid, swab 62 bbls, 3287 ft.

Derby and E. K. Carey's Link A-1, c se se 19-19s-9w, Arb 3263-68 ft, 500 gals acid, swab 62 bbls, 3268 ft.

Duwe & Farris' Hurt 2, c se ne 22-19s-9w, Arb 3246 ft, shot 20 qts, pump 48 bbls, 3273 ft.

Rice County—Pioneer: Aylward Prod. Co.'s Habiher C-1, c se sw 24-19s-10w, Arb 3280 ft, shot 20 qts, pump 77 bbls, 3295 ft.

Rice County—Wenke: Vickers' Rose E-1, c se se 19-20s-10w, Arb 3288 ft, 2000 gals acid, pump 408 bbls, 3293 ft.

Russell County—Trapp: Coralena's Sellens

Wells Completed in the United States in Week Ended April 24, 1943

Data preliminary and subject to revision. Revised and more complete data on all completions shown in monthly summary of drilling, published in second issue of each month. More detailed data on wildcats published in third issue of each month.

State or District	FIELD COMPLETIONS						WILDCAT COMPLETIONS				ALL COMPLETIONS			
	New Wells					Old Wells Deepened							Cumulative	
	*Oil	Gas	†Input	Dry	Total		*Oil	Gas	Dry	Total	This Week	Last Week	This Year	Last Year
Alabama														3
Arkansas												11	55	70
California	18	2			20				4	4	24	32	429	269
Colorado													6	4
Georgia														2
Illinois	11			9	20	1			8	8	29	37	608	585
Indiana		1		1	2	1			1	1	4	4	90	115
Kansas	16			4	20	1	1		5	6	27	37	470	524
Kentucky	1	1		2	4				1	1	5	2	83	48
Louisiana	6				6						6	15	166	346
North Louisiana												10	67	
South Louisiana	6				6						6	5	99	
Michigan	3				3				3	3	6	12	145	217
Mississippi													8	52
Missouri													3	15
Montana													58	51
Nebraska														16
New Mexico	2			1	3				1	1	4	4	83	133
New York	12		8		20						20	20	356	389
Ohio	2	10		8	20	1					21	17	282	375
Oklahoma	3	3	2	7	15	3	2		4	6	24	28	438	558
Pennsylvania	37	5		1	43						43	42	786	1,249
Tennessee													1	4
Texas	33	1	2	12	48	3	5		14	19	70	82	1,183	2,326
E.T.BorderCo.'s												1	6	
East Texas Field													2	
Rest of E. Texas	2		2	1	5		1		1	2	7	4	69	
North Texas	7			4	11		2		1	3	14	20	274	
West Central	2			4	6				2	2	8	8	101	
West Texas	7			1	8	3			1	1	12	21	273	
Panhandle	3				3						3	3	73	
Upper Coast	5				5						5	2	76	
Lower Coast	7	1		2	10		2		2	4	14	14	175	
Southwest Texas									7	7	7	5	110	
South Central												4	24	
West Virginia		8		2	10	2					12	12	195	228
Wyoming													40	30
Total U. S.	144	31	12	47	234	12	8		41	49	295	355	5,485	7,609

* Includes distillate wells. † Includes salt water disposal wells.

1, sw sw nw 19-15s-13w, Arb 3290 ft, pump 340 bbls, 3310 ft.

Sedgwick County—Goodrich: Sam Springer's Sunnydale 1, c ne ne 22-25s-1e, Stanaker 2138 ft, abnd 2180 ft.

KANSAS WELLS DEEPENED

Reno County—Zenith: Magnolia's Darr 3, c se nw 6-24s-10w, otd 3718 ft, Viola 3727-28 ft, flow 41 bbls 8 hrs, 3728 ft.

KANSAS WILDCATS

Edwards County — Failure: Broderick & Gordon's Cross 1, c nw ne 6-24s-17w, Lansing 3865 ft, Arb 4686 ft, abnd 4724 ft.

McPherson County — Failure: Globe O&R Co.'s Nelson 1, se sw se 13-18s-4w, Arb 3707 ft, abnd 3742 ft.

Phillips County — Failure: Northern Ordnance's Perry 1, c sw sw 20-3s-20w, Arb 3739 ft, abnd 3790 ft.

Pratt County—New Field: Lion OR Co.'s Ford 1, ne ne se 12-26s-12w, Viola 4136 ft, flow 23 bbls per hr for 12 hrs, 4145 ft.

Rush County—Failure: Stanolind's Tammen 1, c n½ nw sw 11-19s-19w, Arb 4211 ft, abnd 4246 ft.

Stafford County — Failure: Virginia Drlg. Co.'s Herter 1, nw ne se 1-21s-12w, Arb 3505 ft, abnd 4246 ft.

KENTUCKY

Daviess County: South Penn.'s Ward 9, 1-N-31, 300,000 gas, Cyp 893-901 ft, td 901 ft.

Hancock County: Burnett et al's Bolling 1, 3-O-34, abnd 422 ft.

Union County: J. E. Amis' Perdue-Robinson 1, 20-P-19, abnd 1913 ft.

Carter's Clements 3, 20-P-19, Walts 1800-10 ft, 87 bbls, 1810 ft.

KENTUCKY WILDCATS

Hancock County: Dexter et al's Shields 1, 25-R-32, abnd 1142 ft.

SOUTH LOUISIANA

Evangeline Parish—Ville Platte: Continental's Haas 10, start s cor sec 43-3s-2e, go nw alg sel for 1550 ft, th at ra 102 ft to lcn in sec 43-3s-2e, 6½-in 10,349 ft, perf 10,200-14 ft, flow 209 bbls, 10/64-in, td 10,349 ft.

Continental's Vidrine-Reed-Vidrine 1, sec 28-3s-2e, 6½-in 10,273 ft, perf 10,148-70 ft, flow 265 bbls, 10/64-in, td 10,273 ft.

Jefferson Parish—Bayou Perot: Texas Co.'s State-Bayou Perot 5, 1956 ft s & 5288 ft e of nw cor sec 6-17s-23e, 7-in 9810 ft, perf 9006-36 ft, flow 151 bbls, ⅛-in, td 9810 ft.

St. Mary Parish—Bayou Sale: Atlantic's St. Mary Parish Land Co. 7, 180 ft e & 2080 ft n of se cor sec 17-16s-9e, 5½-in 10,502 ft, perf 10,410½-13½ ft, flow 95 bbls, ⅛-in, td 11,497 ft.

Terrebonne Parish—Gibson: Shell's Realty Operators 13-B, s 33 deg w 1736 ft on el sec 13 fr ne cor, th at ra n 56 deg 55 mins w 348 ft in sec 13-17s-15e, 5½-in, perf 9190-9200 ft, flow 276 bbls, ⅛-in, td 9534 ft.

Vermilion Parish—Gueydan: Fohs' Humble 3, 2897 ft w & 2649 ft n of se cor sec 27-11s-1w, 5-in 9691 ft, perf 9683-88 ft, flow 168 bbls, ⅛-in, td 9724 ft.

MICHIGAN

Bay County—Kawkawlin: Gulf's Paige 2, n½ nw nw 34-15n-4e, Dundee 2900-30 ft, swab 26 bbls, td 2934 ft.

Mecosta County — Fork: Smith Petroleum Co.'s Plummer 1, s½ ne ne 7-16n-7w, Dundee 3833-39 ft, flow 216 bbls 12 hrs, td 3839 ft.

Osceola County—Cedar: Ohio's Zimmerman 2, s½ se ne 28-18n-9w, Dundee 3810-11 ft, flow 192 bbls 22 hrs, td 3932 ft.

MICHIGAN WILDCATS

Antrim County — Failure: Ohio's Lumber Co. 1, w½ nw se 3-30n-6w, Dundee 1698 ft, abnd 1923 ft.

Clare County—Failure: Rowmor and Leonard's Throop 1, s½ ne ne 11-20n-6w, Dundee 3773 ft, abnd 3782 ft.

Van Buren County—Failure: T. C. Hudson's Cross 1, sw nw ne 35-1s-16w, Traverse 1071 ft, abnd 1087 ft.

NEW MEXICO

Eddy County: Nay Hightower et al's Grier 6, c nw se 31-16s-31e, flow 600 bbls, 2-in, 3041-84 ft.

A. H. Hover et al's State-Arlgood 1, 19-17s-28e, abnd 528 ft.

Emperor Oil Co.'s Puckett 6-B, c ne ne 25-17s-31e, flow 75 bbls, 2-in, 2950-80 ft, td 3945 ft.

NEW MEXICO WILDCAT

Eddy County—Failure: Robt. E. McKee-Stanley Jones' Jones 1, c ne sw 36-18s-26e, elev 3278 ft, abnd 1500 ft.

OKLAHOMA

Carter County—Ardmore: Samedan's Jolliff 2, c ne nw 24-5s-1e, hard sand 4065-95 ft, slight stain 2995-3020 ft, abnd 5385 ft.

Creek County—Glenn: Gulf's Pitman 39, Glenn 1425 ft, input well, 1576 ft.

Gulf's Berryhill 33, c se sw 9-17n-12e, Glenn 1328 ft, abnd 1558 ft.

Gulf's Berryhill 37, c s½ se 9-17n-12e, Glenn 1412 ft, input well, 1580 ft.

Creek County—Stroud: Texas Co.'s Hood 5, c sw nw 7-14n-7e, Tonkawa 1208 ft, 7,700,000 gas, 1285 ft.

Haskell County—Unnamed: Grimem's Davis 1, c ne nw 10-9n-18e, Hartshoren 1170 ft, 200,000 gas, 1320 ft.

Hughes County—Unnamed: Bradley Bros.' Hall 1, c nl n½ nw 28-6n-8e, Senora lime 1192 ft, abnd 1325 ft.

Logan County—Crescent: Sunray's Wells 1, se se nw 26-17n-4w, Layton 4973 ft, flow 245 bbls 18 hrs, 4982 ft.

Marshall County—Cumberland: Pure's Little 6, se nw sw 28-5s-7e, McLish 5527 ft, flow 480 bbls, 6032 ft.

Pawnee County—E. Watchorn: Phillips' Oldham 2, sw nw sw 24-23n-3e, Wx 3836 ft, flow 254 bbls, 3847 ft.

Pittsburgh County—S. Canadian: Scheme's Schudel 2, c nw 6-6n-16e, sand 1954 ft, 1,400,000 gas, 2245 ft.

Pottawatomie County—Lake Shawnee: J. E. Crosbie's Harrington 1, c n½ se 29-10n-2e, Wx 6029 ft, abnd 6040½ ft.

Seminole County—Keokuk: Carter's Renton 2, c s½ ne nw 2-10n-6e, Woodford 4097 ft, abnd 4140 ft.

Stephens County—N. Duncan: R. P. Coats' Slaving 1, sw sw se 29-1n-8w, sd and shale 2450 ft, abnd 2550 ft.

Stephens County—Empire: H. Palmer's Ledford 1, c sw sw 28-1s-8w, sand 2585 ft, abnd 2800 ft.

OKLAHOMA WELLS DEEPENED

Okmulgee County—Morris: Link's Nelson 5, se ne se 21-13n-14e, otd 1582 ft, lime 1839 ft, abnd 2000 ft.

Payne County — Cushing: Okla Gasoline Plants' Bickell 1, c nw sw 2-18n-6e, otd 3276 ft, sand 3450 ft given 3000 gals acid, pump 7 bbls, 3454 ft.

Pottawatomie County — St. Louis: Deep Rock's Tolen 6, sw se sw 30-7n-5e, otd 4200 ft, green shale 4305 ft, 2000 gals acid, pump 10 bbls oil, 8 wtr, 4307 ft.

OKLAHOMA WILDCATS

Creek County—Discovery: Sun's Frye 1, se se nw 10-14n-7e, shot 40 qts 2730-52 ft, flow 63 bbls, 3375 ft.

Creek County—Failure: Rudco's Rudman 1, se sw ne 36-14n-10e, Dutcher 2525 ft, Viola 3392 ft, Wx 3432 ft, abnd 3456 ft.

Lincoln County — Discovery: Stanolind's Leonard 1, sw sw sw 10-12n-2e, Wx 5633 ft, flow 16 bbls first hr, 5644 ft.

Lincoln County—Failure: Lastecas' Darby 1, se se se 30-16n-5e, Hunton 4380 ft, Viola 4485 ft, Wx 4555 ft, abnd 4595 ft.

Danciger's Ralston 1, ne sw se 20-17n-2e, Viola 4833 ft, 1st Wx 4923-54 ft, abnd 5020 ft.

Okmulgee County—Failure: J. L. Reynolds' Spears 1, sw sw ne 32-14n-11e, Wx 3205-12 ft, abnd 3212 ft.

EAST TEXAS

Smith County—Chapel Hill: Chapel Hill Gas System's Bradley 1, 2700 ft ewl and 6050 ft nsl T. P. Payne sur, abnd by order OPC, td 2974 ft.

Wood County — Hawkins: Humble's Yates 1-B, 467 ft snl and 3190 ft ewl Geo. Brewer sur, Woodbine 4176 ft, flow 474 bbls, ¼-in, perf 4587-94 ft, td 4688 ft.

Wood County—Quitman: Shell's Goldsmith 3, 1992 ft snl and 1747 ft ewl of 609.77-ac lse, and W. W. Lanier sur, elev 441 ft, Georgetown 4967 ft, Goodland 6196 ft, Paluxy series 6269 ft, flow 69 bbls, ¼-in, perf 6278-6304 and 6326-40 ft, td 6485 ft.

EAST TEXAS EXTENSION

Wood County—Quitman: Roger Lacy et al's Stone-Johnson 1, 1800 ft nsl and 467 ft ewl Hazard Anderson sur, elev 446 ft, Georgetown 5040 ft, Goodland 6228-95 ft, Paluxy series 6295 ft, sand 6302 ft, flow 723 bbls, ¼-in, perf 6310-35 ft, td 6383 ft, 1 mi ne extension.

EAST TEXAS FIELD WELLS DEEPENED

Rusk County—Joiner Area: East Texas Salt Water Disposal Co.'s W. Shaw-Humble 3, F. Cordova sur, otd 3704 ft, injects 2.3 bbls water per minute 25-in vacuum, sand 3738-3803 ft.

Smith County—Joiner Area: East Texas Salt Water Disposal Co.'s Henson-Sun 7, Juan Vargas sur, otd 3696 ft, injects 4 bbls water per minute 18-in vacuum, sand 3726-3889 ft.

EAST TEXAS WILDCAT

Leon County—Failure: Albert Plummer et al's Henry 1, 3500 ft from nw and 2100 ft from ne lines Robert Rogers sur, elev 433 ft, Wilcox 1185 ft, abnd 6482 ft.

NORTH TEXAS

Archer County: L. T. Burns et al's Turbeville 2-R, 330 ft out sec blk 160, Robt. Carson sur, abnd 1527 ft.

M. T. McLaughlin et al's Richardson-King 1, 330 ft snl and 1070 ft wel of s½ blk 3, MEP&P Ry sur A-715, abnd 1253 ft.

J. S. Smith et al's Longley 4-B, TE&L 1839, pump 6 bbls, perf 950-54 ft, td 957 ft.

Cooke County—Wilson: Burk Royalty Co.'s Giles 1, 330 ft s and 781 ft e of swc BBB&C, but in Wm. Moore sur A-628, abnd 2540 ft.

Cooke County—Walnut Bend: Sinclair Prairie's Cox 10-B, 229 ft snl and 85 ft wel blk 60, Fannin CSL, flow 1210 bbls, 2-in, Basal Strawn perf 5374-5444 ft, td 5454 ft.

Sinclair Prairie's Cox 11-B, 230 ft snl and 1328 ft ewl blk 60, Fannin CSL, flow 605 bbls 2-in, perf 5382-5420 ft, td 5518 ft.

Jack County—Myers: Elmore Oil Corp.'s Myers 2, 350 ft nsl and 467 ft ewl SP Ry-Rudmose sur, pump 226 bbls oil, 17 water, 2345-53 ft.

Jack County — Ellis-DuBose: Hanlon & Buchanan's Jones 1, 1600 ft snl and 5000 ft wel lot 6, J. W. Williams sur, Bend 4818 ft, flow 213 bbls, plus 5% water, ¼-in, acid 3000 gals 4827-4912 ft.

Wichita County—K-M-A Ellenburger: E. C. Oil Co.'s LeBus 9-E, 630 ft snl and 710 ft wel s-100-ac W. H. Spillers sur, Ellenburger 4248 ft, flow 338 bbls 2-in, 4256-60 ft.

Wilbarger County—Harrold: R. H. Dearing & Sons' Cochrain 1-B, 330 ft ewl and 1460 ft snl H&TC 47, blk 13, abnd 3451 ft.

Wilbarger County: Phillips' Waggoner Est. 225, H&TC 44, blk 4, pump 14 bbls, shot 40 qts 1838-43 ft, td 1861 ft.

NORTH TEXAS WILDCATS

Clay County—Discovery: Akin - Dimock et al's Stephenson 1, 330 ft snl and 330 ft from se line blk 55, Specht & McCutcheon sur, pump 31 bbls, sand 1135-42½ ft.

Jack County—Failure: Joe A. Worsham et al's Hensley 1-A, 1900 ft snl and 3350 ft ewl Thos. Martinez sur A-388, abnd 5335 ft.

Young County—Allar New Pay: Panhandle Ref. Co. et al's Mayes 1, 467 ft ewl and 958 ft nsl S. Anderson sur A-3, elev 1170 ft, Bend 3552 ft, flow 524 bbls, 24/64-in, acid 2000 gals 3552-72 ft.

TEXAS PANHANDLE

Carson County: Continental's Burnett 2-G, c ne se I&GN 126, blk 5, pump 74 bbls, 3035-65 ft, td 3085 ft.

Gray County: Magnolia's Fee (Tr. 227) 61, I&GN 11, blk 3, pump 44 bbls, granite wash 2927-52 ft.

Hutchinson County: J. E. Crosbie's Pitts 53, 330 ft snl and 6314 ft wel TC Ry 9, blk M-21, pump 124 bbls, shot 450 qts 2822-2912 ft.

WEST TEXAS

Cochran County—Slaughter: Honolulu and Saltmount Oil Co.'s Blake 1, 510 ft out nec lab 14, leag 54, Oldham CSL, flow 1598 bbls cas, acid 10,000 gals 5053-91 ft.

Crockett County—Olson: Plymouth Oil Co.'s (was Olson) Shannon 2-A, 660 ft out swc nw of sw-800-ac of leag 1, Archer CSL, pump 161 bbls, acid 500 gals 2053-60 ft.

Hockley County—Slaughter: Jerry Hawkins et al's Mallet 13-A, 580 ft out nec lab 23, leag 47, Edwards CSL, flow 715 bbls, 2-in, acid 11,500 gals 4934-78 ft.

T. F. Morrow et al's Mallet 24, 580 ft out nwc lab 18, leag 48, Edwards CSL, flow 729 bbls cas, acid 12,000 gals 4900-50 ft.

T. F. Morrow et al's Mallet 34, 580 ft nsl and 440 ft wel lab 11, leag 48, Edwards CSL, flow 642 bbls cas, acid 12,000 gals 4900-40 ft.

Trinity Dr. Co.'s Slaughter 1, 440 ft out nwc lab 18, leag 35, Zavalla CSL, flow 486 bbls cas, acid 12,000 gals 4990-5035 ft.

Pecos County—Walker: Jas. L. Cooper et al's University-Humble 3, 2050 ft nsl and 1750 ft wel sec 13, blk 16, flow 74 bbls oil, plus 3% water, ¼-in, shot 100 qts 2092-2121 ft.

Stonewall County—Carlisle: Hunter & Hunter et al's Harrison 1, 810 ft ewl and 660 ft

EQUAL DISTRIBUTION OF PRESSURE

UNIBOLT Couplings with their three interlocking shelves, or 3-point suspension, employ a proven principle and thus assure equal distribution of pressure on the seal ring.

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THORNHILL-CRAVER COMPANY
HOUSTON

snl e-160 of n-166-ac H&TC 294, blk D, elev 1804 ft, Palo Pinto 5169 ft, abnd 5220 ft.

WEST TEXAS WELLS DEEPENED

Upton County — McCamey: Continental et al's Reese 12, 330 ft nsl and 1650 ft wel 240-ac in s½ MK&T 2, blk 3, otd 2400 ft, pump 12 bbls oil, 4 water, acid 500 gals 2438-43 ft.

Shell's Estep 1, 160 ft nsl and 330 ft ewl MK&T 18, blk 3, otd 2250 ft, pump 16 bbls oil, water, acid 1000 gals 2209-2329 ft.

Winkler County—Keystone: Sid Richardson et al's Jenkins-Conoco 5, PSL 13, blk 77, otd 3355 ft, flow 20 bbls gas lift, shot 310 qts 3360-3487 ft.

WEST TEXAS WILDCAT

Pecos County—Failure: Magnolia's Eaton 1, 2970 ft from ne and 990 ft from se lines H&TC 29, blk 3, elev 2430 ft, Yates sand 1500 ft, base Permian and top detrital 5410 ft, Simpson 6375 ft, Tulip 6710 ft, McKee 7169 ft, Waddell 7659 ft, Ellenburger 8110 ft, abnd 8315 ft.

TEXAS GULF COAST

Chambers County — Oyster Bayou: Sun's Jackson 14, 660 ft fr sl & 530 ft fr el of 40-ac unit, 10,142-ac tr, TNO 123, 5½-in 8375 ft, perf 8230-60 ft, flow 606 bbls, ¼-in, td 8375 ft.

Jefferson County—Stowell: Glenn H. McCarthy's Hankamer 2, 660 ft fr s&el blk 11, Koch subdvn, B. A. Vacocu Lge, 5½-in 8930 ft, perf 8880-82 ft, flow 298 bbls, 9/64-in, td 9801 ft.

Glenn H. McCarthy's Van Til 1, 330 ft fr s&wl 40-ac lse, Theo. F. Koch subdvn, L. Lopez sur, 5½-in 7763 ft, perf 7637-45 ft, flow 225 bbls, 9/64-in, td 8008 ft.

San Jacinto County—Mercy: Shell's Foster 6, start se cor J. R. Richardson sur, go 1775 ft almost due e, thence 75 ft n at ra to lcn in William Dobie sur, 5672-ac lse, 5½-in 8275 ft, sand 8275 ft, flow 177 bbls, ⅛-in, td 8289 ft.

Shell's Stringer 1, 50-ac tr, Kelly Holliday sur, 5½-in 8271 ft, completed open hole 8271-86 ft for 145 bbls, ⅛-in, td 8286 ft.

LOWER TEXAS COAST

Jackson County — North LaWard: Cities Service's Chamrad Unit 3, 2410 ft fr el & 660 ft fr sl 225-ac unit, Pickering Ranch subdvn, Jessie White sur, 5½-in 5248 ft, perf 5220-32 ft, flow 386 bbls, 3/16-in, td 5248 ft.

Jackson County—Mayo: Texas Co.'s Tunison 8, 611 ft fr el & 713 ft fr s'ly sl of 457-ac tr, Morris & Cummings sur 11, 5½-in 5715 ft, perf 5095-5105 ft, flow 19 bbls, 3/32-in, td 6568 ft.

Jim Wells County—Seeligson: Premont Development Co.'s Eastburn 1, 665 ft fr sl & 660 ft fr el blk 7, R. P. Haldeman subdvn, BS&F 361, 5½-in 6115 ft, perf 6058-80 ft, flow 125 bbls, 7/64-in, td 6115 ft.

Sun Oil Co.'s Miller 1, 660 ft fr nl & 1980 ft fr el Nancy Russell sur 336, 919-ac tr sec 66, R. P. Haldeman subdvn of Seeligson Rch, 5½-in 5955 ft, perf 5926-30 ft, flow 127 bbls, 7/64-in, td 5956 ft.

Transwestern Oil Co.'s Seeligson 2-B, 1798 ft fr sl & 727 ft fr el sec 64, R. P. Haldeman subdvn, Seeligson Rch, H. P. Koopman sur 235, 5½-in 6250 ft, perf 6113-17 ft, flow 78 bbls, 7/64-in, td 6250 ft.

Kleberg County—Seeligson: Humble's King Ranch-Cabeza 15, 1980 ft fr wl & 162 ft fr nl of GH&H 49 on 5420-ac portion of King Ranch, 5½-in 5955 ft, sand 5213 ft, flow 124 bbls, ⅛-in, td 5955 ft.

Kleberg County—Stratton: Chicago Corp.'s Wardner 54, 3000 ft nw'ly alg sl fr se cor 8862-ac lse, Paso Ancho de Abajo gr, 7-in 6600 ft, perf 6345-70 ft, flow 16,000,000 gas, perf 6520-60 ft, flow 18,000,000 cf wet gas, td 6600 ft.

Live Oak County — South White Creek: Buckaloo & Holland's Jackson 1, 330 ft fr sl & 1100 ft fr el s½ farm tract, blk 72, Dr. C. F. Simmons subdvn, BS&F 15, abnd 1885 ft.

Refugio County—Greta: Monday Oil Co.'s Heard 8, 638 ft fr nl & 1355 ft fr el 425-ac lse, J. H. People sur, 5½-in 4456 ft, perf 4405-13 ft, flow 81 bbls, ⅛-in, td 4456 ft.

San Patricio County—Midway: Midway-Victory Oil Co.'s Ivey 1, 467 ft fr nw & nel's of 796-ac tr, G. H. Paul subdvn, SA&MG 6, A-153, abnd 6650 ft.

LOWER TEXAS COAST EXTENSIONS

Jackson County—Sterling: John B. Coffee's York 1, 330 ft fr se & swl's of 154-ac lse out of ne portion of 357-ac tr, W. D. Sutherland sur, abnd 4900 ft.

Nueces County—Agua Dulce: Hiawatha Oil & Gas Co.'s Dryden 1, 467 ft fr n&el's w-240-ac of n½ sec 192, se flank, 5½-in 7165 ft, perf 7120-24 ft, flow 140 bbls, ⅛-in, td 7165 ft. Extends oil production ½ mi sw.

Refugio County—Woodsboro: Southern Minerals' Wood 3, 660 ft fr s&el's 349-ac tr, 5½-in 5500 ft, perf 5440-45 ft, flow 29 bbls dist, 1,140,000 gas, 3/16-in, td 6040 ft. Extends production se.

LOWER TEXAS COAST WILDCAT

Jackson County—Failure: Humble's Peters 1, El Toro area, 8780 ft fr swl & 660 ft fr nwl 1070-ac tr, Juan Fernandez Lge, abnd 6173 ft.

SOUTHWEST TEXAS EXTENSION

Starr County—Ulrich: Continental's Sugarland Industries 1, 330 ft fr n&el's e 100-ac of 500-ac tr, porc 91 & 92, Santago Lopez sur, abnd 5503 ft, 3500 ft e discovery well.

SOUTHWEST TEXAS WILDCATS

Duval County: L. A. Douglas' Labbe 1-A, 467 ft fr n&wl's 167-ac lse, sw½ I&GN sur 2, A-1989, abnd 2885 ft.

Duval County: H. J. Porter's Dunn 2-A, 1980 ft fr wl & 8800 ft fr nl of Diego de Hinnojosa gr, A-629, 1600-ac lse, abnd 4104 ft.

Starr County: Baldridge & King's Hinojosa 1, 2640 ft fr nl&el of share 1, porcion 109-110-111, 800-ac lse, 2 mi sw Cuevitas field, abnd 2200 ft.

Webb County: Forest Development Corp.'s Bruni 1, 1650 ft fr n&el's blk 49, Brown subdvn, Albercas de Arriba gr, 2 mi n Mirando Valley field, abnd 2515 ft.

Caldwell County: Paul D. Crawford's Wray 1, Walnut Creek area, 660 ft fr se&nel's 100-ac tr, Lobit subdvn, Pablo Martinez gr, 1 mi se Lytton Springs, abnd 1311 ft.

Williamson County: A. A. Zizinia's Bland 1, 666 ft fr sel 455-ac tr, 3 mi se Taylor, abnd 675 ft.

WEST CENTRAL TEXAS

Callahan County: C. D. Miller et al's McClure 1, 6000 ft nsl and 3800 ft wel Edward Shipman sur 5, elev 1863 ft, lcn.

Coleman County: Sohio Producing Co.'s G. O. Creswell 1, nw nw nw GH&H 92, blk 2, lcn.

Comanche County: P. S. Groginski et al's R. A. Faulkner 1, 1000 ft snl and 330 ft wel ET 3, A-292, lcn 650-ft test.

Dave Montgomery et al's Don Moorman 1, 2833 ft nsl and 2500 ft wel D&DA 37, lcn 2800-ft test.

Jones County: Butler-Horne Drl. Co.- Geochemical Surveys' J. R. Lea 1, 330 ft out nwc se-40 of 199-ac tr, blk 3, J. Winters sur, lcn.

Harry Hines et al's Stephenson 1, 1702 ft nsl and 330 ft ewl T&P 7, blk 16, lcn 2500-ft test.

Merry Bros. & Perini's Bowyer 1, 1680 ft nsl and 1120 ft wel of 255-ac tr, BBB&C 37, lcn.

WEST CENTRAL TEXAS

Coleman County—Coker: Eugene Constantin et al's Sealy-Smith 1, 660 ft nsl and 510 ft ewl H&H 71, blk 2, elev 1922 ft, top Morris 3008 ft, flow 203 bbls, ¼-in, 3008-38 ft.

Hamilton County—Pottsville: R. Grossenbacher et al's Stegemuller 1, 660 ft from sw and se lines 149.6-ac lse, L. W. Dickerson sur 25, elev 1412 ft, Marble Falls 2676 ft, abnd 3065 ft.

Jones County—Strand: J. C. Hunter & Sons' Bettis 1, 1650 ft nsl and 510 ft wel TC 1, elev 1570 ft, Palo Pinto 3464 ft, abnd 3685 ft.

Jones County—Wimberly: North American Oil Consolidated (was S. C. Herring et al)'s Hardy 1, 330 ft out sec blk 68, DeWitt CSL Leag 126, abnd 2540 ft.

Palo Pinto County: Hickok P&D Co.-Harry Reynolds-States Oil Corp.'s Johnson 1-C, 7900 ft from sw and 330 ft from nw lines B. McNeely sur A-329, abnd 2809 ft.

Shackelford County: R. H. Roark et al's Nail 4, 660 ft nsl and 2640 ft wel ET Ry sec 135, elev 1691 ft, pump 18 bbls, acid 1000 gals 1502-09 ft, td 1512 ft.

WEST CENTRAL TEXAS WILDCAT

Callahan County—Failure: Crabb & McNeel's Knight 1, 1880 ft snl and 1950 ft ewl Geo. Eubank-Edwards sur 185, elev 1732 ft, abnd 606 ft.

Shackelford County—Failures: Fain & McGaha's Gustafson 1, sw sw nw BBB&C 169, abnd 1667 ft.

R. H. Roark et al's Todd 2, se ne sw BAL 11, abnd 665 ft.

United States Wildcat Starts

CALIFORNIA

Kern County: P. H. Frank & Co.'s 1, 24-29-20, McKittrick area, lcn.

Madera County: Pure Oil Co.'s Gamboni 1, 28-10-13, Chowchilla area, rig.

ILLINOIS

Edwards County: A. F. Dye's Scherckan 1, w½ sw sw 18-1n-14w, lcn.

Fayette County: Cameron Bros.' Seibert 1, se se nw 33-5n-3e, lcn.

Jasper County: Pure's Bergbower B-1, ne se 9-6n-10e, lcn.

Jefferson County: Seaboard's Eldridge Comm 1, ne se ne 3-4s-3e, lcn.

Richland County: Black et al's Moseley 1, sw ne 15-3n-9e, lcn.

Hiawatha O&G Co.'s Wharf 1, nw se 11-3n-10e, lcn.

White County: Ryan Oil Co.'s Bisch 1, sw se se 30-3s-14w, lcn.

INDIANA

Clay County: H. C. Dietrich's Duncan 1, se ne se 27-9n-6w, lcn.

Posey County: Sun's Trimble 1, nw sw se 13-7s-12w, lcn.

Carter's Dixon 1, sw sw nw 29-7s-12w, lcn.

KANSAS

Stafford County: J. H. Hershey's Dunn 1, swc ne 26-23s-13w, cellar.

Plains Expl. Co.'s Kelly 1, c e½ ne se 8-24s-11w, lcn.

KENTUCKY

Daviess County: Andrew Teller, Tr.'s Alzey 1, 15-N-28, lcn.

Henderson County: Iley Browning et al's Strum 1, 2-N-23, dr.

McLean County: Miller & Shiarella's Miller 1, 12-N-27, dr.

MICHIGAN

Arenac County: C. W. Teater's Roush 1, s ½sw sw 10-20n-5e, lcn.

Missaukee County: Gordon Oil Co.'s Miller 1, n½ nw sw 27-23n-7w, rig.

Osceola County: C. L. Maguire, Inc.'s Bloemsa 1, sw se 4-20n-8w, rig.

OKLAHOMA

Hughes County: W. A. Delaney, Jr.'s Williams 1, c sw nw nw 22-6n-8e, dr 2830 ft.

Marshall County: Sinclair Prairie's Taylor 1, c sw nw 8-5s-5e, lcn.

Murray County: Rodgers Bros.' Vanderslize 2, c nw se 25-2n-2e, dk.

Noble County: T. P. Morgan's Devore 1, nw nw sw 17-24n-1e, dr.

Osage County: Norbla & Peters' Osage 1, sw sw nw 7-26n-5e, dr.

EAST TEXAS

Kaufman County: Mrs. Mae Belcher et al's Workman 1, 660 ft out nwc tract, N. Daugherty sur, 2½ mi nw Scurry, lcn Woodbine test.

NORTH TEXAS

Montague County: R. H. Dearing & Sons' Fields 1, 660 ft from ne and nw lines sec 24, J. Fields sur A-1083, lcn 8000-ft test.

Wichita County: Continental et al's West 1, 4922 ft snl and 330 ft wel of 411.17-ac tr, G. W. Scott sur A-254, 2 mi nw Wichita Falls, lcn 5500-ft test.

WEST TEXAS

Fisher County: Hunter & Hunter's Fillingim 1, c nw sw H&TC 112, blk 3, lcn 4500-ft test.

Hale County: Amerada's Kurfees 1, c nw nw H&TB 6, blk N, 10 mi se Plainview, lcn 11,000-ft test.

Pecos County: C. W. Brown and L. H. Choate's Barnes-State 1, 660 ft from ne and se lines H&GN 132, blk 10, lcn 2000-ft cable tool test.

Sterling County: Robt. L. Cannon and B. C. Mann's Foster 1, c ne se H&TC 4, blk 21, lcn 2900-ft cable-tool test.

LOWER TEXAS COAST

Aransas County: Southern Minerals' Mortgage Land & Inv. 2, 1980 ft fr nw & 660 ft fr se&swl of nw½ sec 77, Alonzo Marsh sur, 2 mi nw McCampbell, rigging 7500-ft test.

Bee County: Hewitt & Dougherty's Cantu 1, nw nw section 81, G. H. Paul subdvn, J. J. Welder Rch, Benjamin Dale sur, moving in.

Bee County: W. Earl Rowe and Rodney DeLange's Driscoll 1, 660 ft fr n&wl blk 36, Thomas Banuelos sur, lcn 5800-ft Vicksburg test.

Jackson County: W. Stewart Boyle's Budd 1, 625 ft fr n&sel of 224-ac lse, I&GN 7, blk 3, lcn 3000-ft test.

Karnes County: Luling Oil & Gas Co.'s Faith 1, 1330 ft fr nl & 330 ft fr el 202-ac tr, R. C. Brashear sur 534, mim.

Karnes County: Plymouth Oil Co.'s Bridges 1, 330 ft fr nw&swl 89-ac lse, Phineas Ripley sur, mim.

Nueces County: W. A. Richardson's Tally 1, 660 ft fr s&el sec 18, G. H. Paul subdvn, Driscoll Rch, 2 mi se Robstown, lcn 7500-ft test.

Victoria County: Texas Co.'s Gayle 1, 330 ft fr ne & nwl of 110-ac lse, John Hughes sur, lcn.

SOUTHWEST TEXAS

Jim Hogg County: Rodney DeLange and Locke Purnell's East 1, 200-ac lse, E. Trible sur 619, rigging up.

Starr County: Sun's Alvardo 2, 1030 ft fr

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n&el CCSD&RGNG 553, 2 mi se North Rincon field, lcn 7500-ft test.

TEXAS GULF COAST

Chambers County: Arkansas Fuel Oil Co.'s Frankland 1, 4 mi nw Smith Point, 188-ac tr, R. Frankland sur, lcn 10,500-ft test.

Colorado County: Shell's Thompson 1, Mustang Creek area, 1366-ac tr, Samuel Kennelly sur, 1½ mi n Garwood, lcn 11,500-ft Wilcox test.

Squeaks from the Bull Wheel

Character Study

"They say you can tell a girl's character by her clothes."

"Oh, come now. Surely they have more character than that."

One Siamese Twin to another: You must have had a swell time last night. I look like a wreck today.

And When?

"They tell me your wife is outspoken."

"By whom?"

Magic

A drunk, watching a revolving door, saw a man walk in. Soon the revolving door revealed a pretty girl stepping out.

"It's a good trick," said the drunk, "but I still don't shee what that guy did with hish clothes."

Mistake

"I suppose you're still angry because I came home late last night with this black eye."

"Maybe you've forgotten, but when you came home, you didn't have that black eye."

Lost It

At the wedding, Sandy McTavish, the groom, looked so troubled that the best man was moved to inquire, "What's up, Sandy? Hae ye lost the ring?"

"Nae."

"Then hae ye lost the railroad tickets?"

"Nae, mon, it's a muckle worse than that."

"Hoot, mon! What is it?"

"Ah hae lost ma enthusiasm!"

Deflation

"I guess you've gone out with worse-looking fellows than I am, haven't you?"

No answer.

"I say, I guess you've gone out with worse-looking fellows than I am, haven't you?"

"I heard you the first time. I was just trying to think."

Proof

Henry: "My dear, I really don't believe you can ever teach that dog to obey you."

Mrs. Peck: "Nonsense, darling. Remember how obstinate you were when we were first married."

Low and High

"Have you noticed how a woman lowers her voice whenever she asks for anything?"

"Oh, yes, but have you noticed how she raises it if she doesn't get it?"

Green Light

Gob: "Can you read my mind?"

Gal: "Yes."

Gob: "Go ahead."

Gal: "No, *you* go ahead!"

Good Night

Boot: "May I have the last dance with you?"

Debutant (limping a little): "You have just had it!"

Speller

"My kid brother is only three and he can spell his name backwards."

"Remarkable. What is his name?"

"Otto."

Momentarily

"When you went to the seaside, did you keep your eyes open for a boy friend?"

"No. I closed one of them."

Fair Proposition

"Young man, my time is worth $100 a minute, but I believe I can give you a four-minute interview."

"Make it two minutes, sir, and I'll take cash for the balance."

Probably

Mother: "You know, Geoffrey, Norma is nearly 17 years old, so today I had a frank discussion with her about the facts of life."

Dad: "Ah! Did you learn anything new?"

Incredible

"I'm glad, dear, that you are impressed by all the explanations I have been giving you about banking and currency."

"Yes, darling. It seems wonderful that anyone could know as much as you about money without having any."

Forgetful Doctor

"Give me some of that prepared mino-aceticacidester of salicylic-acid."

"Do you mean aspirin?"

"Yeah! I never can think of that name."

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Notes for the Equipment Buyer and User

Measuring Machine

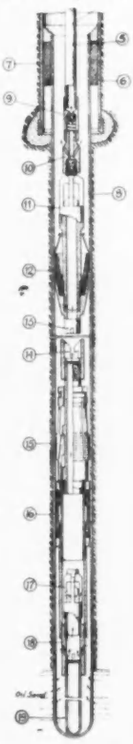
MOSER MANUFACTURING COMPANY

Moser Manufacturing Company, Kane, Pennsylvania, announces a well-depth-measuring machine with which no measuring line nor reel is used. The machine works directly on the sand line and the manufacturer claims an accuracy of plus or minus two inches in field operation on 4500 foot wells. When measurement is to be taken, driller lowers bailer to bottom, slides the unit up to the sand line, closes two spring latches, then reels up the bailer at about 200 feet per minute. The depth of the well is then read directly on a dial indicator. The latest models have been re-designed to use non-strategic metals permitting immediate delivery.

Gas Swab Pump

H-PRODUCTION SWAB PUMP COMPANY

H-Production Swab Pump Company, Houston, recently announced a gas swab pump, the main features of which are hollow pump rods, poppet type gas valves, atomizer nozzle and an oil inlet nipple. These features are assembled according to design with conventional equipment, such as packer, ball-and-seat valves, swab, etc., to make a compact tool, which is said to have particular advantage in wells that have sanded up and ceased flowing.

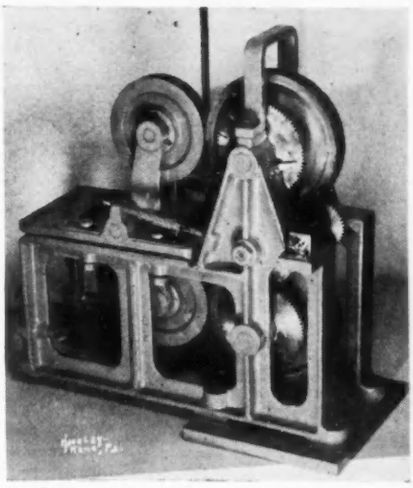


The unit permits natural flow of wells, is capable of supplementing natural flow with gas or air lift, can provide a combination pumping and gas-lift operation, or can be converted to conventional type pumping.

Removal of sand is accomplished by means of a shoe attached on the lower end of the assembly; rotation of the assembly while gas or liquid is circulating will carry the loosened sand up through the tubing. There is no restriction to natural flow, and if lifting aid is necessary, gas is injected from the surface down the hollow pump rod. By means of the poppet valve and atomizer nozzle, the gas lightens the fluid column. Should the well be clogged up, the tool can be used as a swab to initiate the flow, after which gas lift can be used.

These characteristics are said by the manufacturer to make the gas swab pump adaptable to almost every well condition. It can be used with any type well head, is made to be used in various sizes of tubing, and also is designed to function without tubing.

The integral parts of the Gas Swab Pump are as designated: (5) hollow pump rod, (6) casing, (7) packer, (8) liner, (9) gas or airvalve, (10) atomizer, (11) traveling valve, (12) swab, (13) J-tool, male, (14) J-tool, female, (15) holding slips, (16) packer, (17) standing valve, (18) oil-inlet nipple, (19) sand trap.



Moser Measuring Machine

Oxy-acetylene

Air Reduction, 60 E. 42nd Street, New York City, has for distribution a booklet called "Planning Your Oxy-acetylene Installation," which gives much information on oxy-acetylene welding and cutting. The booklet describes the installation and operation of manifolds, acetylene generators and piping systems, including complete plant piping layouts.

Bantam Bearings Corporation Changes Corporate Setup

Bantam Bearings Corporation, South Bend, Indiana, a subsidiary of The Torrington Company of Torrington, Connecticut, for the past eight years, has been merged with its parent company and will henceforth be known as the Torrington Company, Bantam Bearings Division. The Bantam Division will retain its present personnel and continue its operations from the South Bend headquarters.

C. H. Talcott, sales manager of The Torrington Company's bearing division, will continue to direct sales of The Torrington needle bearing. Ray Nichols, vice president and general manager of Bantam, will be in charge of the Bantam Division's operations while sales of needle rollers, quill bearings and other standard and special bearings will be continued under the direction of J. F. Oehlhoffen, sales manager of the Bantam Division.

Army-Navy E Awarded to Johns-Manville Company

Johns-Manville, New York, was awarded the Army-Navy E flag at the Manville, New Jersey, factory, on March 24. Major General Thomas E. Robins made the presentation speech, and the flag was accepted by John E. Begert, plant manager. Commander Austin S. Kibbee presented the lapel insignia which was received by Claude Schollenberger on behalf of the men and Elizabeth Mozell, on behalf of the women. Other speakers included president Lewis H. Brown, Frank Ryan, and Brigadier General James I. Bowers.

Johns-Manville workers and their families attend E award ceremonies.

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Men in the Industry's News

J. ELMER THOMAS, who has been serving as special assistant to Deputy Petroleum Coordinator Ralph Davies in PAW, has returned to Fort Worth and has a temporary office in Fort Worth National Bank Building. He spent almost two years in Washington.

ROBERT GRIFFIN DE LA MATER and WILLIAM SCHWEMLEIN, of Parkersburg, West Virginia, have been awarded Edward Longstreth Medals, jointly, by The Franklin Institute, in recognition of their services in inventing and developing the hydromatic brake, a device for controlling the fall of drilling tools in deep wells.

JOHN R. SUMAN addressed the monthly meeting of the East Texas Section of AIME, at Kilgore, April 20. He spoke on "War and Post War Problems of American Industry."

C. M. FLORENCE has been transferred to Mt. Pleasant, Michigan, as drilling superintendent for Two States Drilling Company. The company is now moving its first rotary rig into Michigan.

JACK ENDRES, scout for Sinclair-Wyoming Oil Company, has been transferred to Mt. Pleasant, Michigan, from Wichita Falls, Texas. Heretofore the company has not had a scouting division in Michigan.

RALPH E. DAVIES, Deputy Petroleum Administrator for War, will address the annual meeting of the Chamber of Commerce of the United States in New York, April 27 to 29. His talk will come under the division of "Fuels and Power for War."

J. J. PERKINS, Wichita Falls oil operator, has announced the gift of a chapel building to be erected on the campus of Southwestern University at Georgetown, Texas.

M. J. WILSON has accepted a position in the executive department of Ohio Oil Company at Findlay, Ohio. Previously, he had been in the Mid-Continent area, at one time with the same company at Tulsa.

BARTON P. SIBOLE, president of Stanolind Pipe Line Company, Tulsa, addressed the Engineers Club of Tulsa on the topic, "Is the Big-Inch Big Enough?"

DR. H. F. HAAS of LaJolla, California, spoke before the Pacific Section of the American Association of Petroleum Geologists, April 23 on "Bacterial Oxidation of Petroleum Products." Dr. Haas is working on the same API research project as Dr. Claude E. ZoBell (see page 15) under auspices of Scripps Institution of Oceanography, concerning the origin of petroleum.

THE FORT WORTH LABORATORIES

Analysis of oil field brines, cores, gas, oil and minerals. Field gas testing. R. H. Fash, Vice President; Long Distance 138. 823½ Monroe Street, Fort Worth, Texas.

ADRIAN MOORE has been appointed PAW director of production for District 3, Houston. He succeeds E. O. Buck who resigned to become South Texas manager for Rowan Drilling Company. More has had 26 years experience in the production of oil, joining the Tarver Drilling Company in 1917, was division manager for Amerada Petroleum Corporation in 1920, later vice president of Rycade Oil Corporation. Since 1931 he has operated as a producer and contractor with offices in Houston.

OTIS F. BEATY has been transferred from Mt. Vernon, Illinois, to Great Bend, Kansas, to direct land operations for Magnolia Petroleum Company in Western Kansas, Colorado and Western Nebraska. He replaces J. S. Hughes who has been transferred to Houston. The Indiana and Western Kentucky district will be handled by Cecil L. Lanier, with offices at Mt. Vernon. Eastern Kentucky will be handled by Eugene L. Fry, with headquarters at Parkersburg, West Virginia.

HILLARD W. CAREY, chief geologist for Halliburton Oil Well Cementing Company and associated interests for the past 10 years, has joined Houston Natural Gas Corporation as head of the production engineering department.

J. M. NISBET, manager of the land, lease and geological division of Cities Service Oil Company, has been elected vice president of the company, and will continue his previous duties.

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